RAILROAD GAZETTE

FRIDAY, FEBRUARY 19, 1904.

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The Cost of Handling Locomotives at Terminals.

BY CHARLES H. FRY.

The following figures, which give the cost of handling locomotives at terminals, have been obtained in all but one instance from the motive power officers of the several roads. They are not presented for the purpose of making critical comparisons, but simply to show what these costs average for different roads in different parts of the country. In many cases the distribution of the charges is given, affording an insight into the system of accounting.

In three cases the name of the road has been withheld by request as the figures are only an approximation. For these anonymous statements the territory and mileage of the road and the number of locomotives owned are given to assist in placing an estimate on their value. Further explanation and some discussion of the subject will be found in the editorial columns.

St. Louis & San Francisco.—The statement from this road gives the average cost of handling engines at 25 different points for six months ending July 31, 1903, the following items being included in making up the costs: Hostlers and assistants, fire cleaners and ash-pit men, front-end cleaners, wipers, boiler washers and assistants, sand dryers, laborers or sweepers, and callers. The average for the six months was $1.57.

	Feb.	Mar.	Apr.	May.	June.	July.
St. Louis	$1.94	$1.40	$1.52	$1.47	$1.50	$1.51
Newburg	1.11	1.18	1.34	1.26	1.10	1.25
Clinton	.80	.85	.90	.88	.85	.87
Springfield-North Side	1.49	1.47	1.75	2.80	2.26	2.21
Springfield-South Side	1.56	1.72	1.76	1.45	1.70	1.74
Monett	1.19	1.66	1.13	1.40	1.59	1.45
Ft. Smith	1.83	2.02	2.03	1.75	1.58	1.65
Hugo	2.73	1.82	1.34	1.30	..	..
Paris	1.30	1.69	1.39	1.19	1.35	1.29
Joplin	1.01	1.65	1.17	1.14	1.46	1.77
Neodesha	1.55	1.78	1.71	1.74	1.88	1.60
Wichita	1.85	1.41	1.36	1.80	1.37	1.31
Cordell	1.35	1.32	..	1.91	2.05	2.08
Sapulpa	1.44	2.15	2.05	1.95	1.94	2.12
Oklahoma City	1.26	1.20	1.23	1.06	.75	1.01
Sherman	2.01	2.31	2.28	1.19	1.57	1.57
Kansas City	1.30	1.76	1.66	1.68	2.11	1.75
Ft. Scott	1.61	1.72	1.93	1.91	2.09	1.82
Willow Springs	1.30	2.46	1.44	1.40	1.36	1.24
Thayer	2.36	1.78	1.36	1.46	1.53	1.65
Jonesboro	1.12	1.41	1.33	1.47	1.28	1.38
Memphis	1.99	2.11	1.89	1.94	2.22	2.01
Birmingham	1.46	1.75	1.64	1.53	1.62	1.65
Amory	..	1.33	1.31	1.46	1.63	1.69
Beaumont	..	..	..	1.06	1.05	1.05
Monthly average	$1.55	$1.66	$1.54	$1.53	$1.58	$1.57

Norfolk & Western.—The figures for this road show the comparative costs by months for the first half of the years 1902 and 1903. The distribution of the charges is given, and the total cost per engine.

Mobile & Ohio.—Statements are made up monthly, showing the total number of locomotives handled at each roundhouse and the average cost of labor distributed to the different heads under which the charges occur. The entry for each of the labor charges is the average cost per locomotive. The statement given is for July 1903.

MOBILE & OHIO.

	No. of loco.	Hostlers.	Boiler-washers.	Callers.	Sand-dryers.	Coalers.	Wipers.	Ma-chinists.	Boiler-makers.	Truck repairers.	Av. cost per loco.
Mobile	359	$0.33	$0.16	$0.13	$0.09	$1.14	$0.85	$1.04	$0.29	$0.56	$4.59
Meridian	625	.33	.15	.09	.05	.58	1.12	.17	.08	..	2.57
Okolona	453	.20	..	..	.08	.63	.99	.60	.17	..	2.67
Artesia	170	.52	.57	.25	.19	2.45	.93	..	..	..	4.91
Tuscaloosa	164	.78	..	..	..	..	..	.30	.08	.13	1.29
Montgomery	180	.36	..	..	..	.34	.38	..	..	..	1.08
Jackson	584	.36	.16	.12	.05	.74	2.00	.62	.25	.13	4.43
Cairo	600	.41	.14	..	..	.68	1.14	..	..	..	2.37
Murphysboro	1,157	.15	.06	.09	..	.40	1.22	.30	.13	.09	2.44
E. St. Louis	540	.29	.11	.16	..	.65	.82	.21	.21	.17	2.62
Whole line	4,832	.30	.10	.08	.03	.80	1.13	.36	.12	.13	3.05

Texas & Pacific.—The cost of despatching locomotives at all terminals on this road, which includes the wages of hostlers, fire-cleaners, table-turners, wipers, etc., from the time the engine is turned over to the hostler by the engineman until he receives it again, was 2 cents per engine mile for 1902, or an average cost per engine, in and out, of $2.21. These figures are exclusive of all repairs.

Wabash.—Quite complete monthly reports are made of the roundhouses on the system by divisions; the number of men employed at each; the number of engines despatched, distributed to class of service; the total cost of repairs and handling; the cost per engine for these last two items; the totals for roundhouses and divisions; a recapitulation by divisions, and a grand total. Figures for number of men and engines, cost per engine for handling and repairs, the recapitulation for the five divisions and the grand totals for the items mentioned are given below, the statement being for June, 1903.

WABASH.

		No. men.	Engines despatched. Pass.	Freight.	Switch.	Work.	Total.	Cost per engine. Repairs.	Handling.	Total.
Eastern Div.	Attica	1	26	26	..	129	181	$0.25	$0.50	$0.75
	Ft. Wayne	9	68	118	160	..	346	.46	.70	1.16
	Lafayette	1	30	95	60	..	185	.06	.49	.55
	Peru	52	331	306	174	..	811	.95	.87	1.82
	Tilton	27	392	284	120	141	937	.54	.81	1.35
	Toledo	8	200	134	120	..	454	1.23	.43	1.66
	Total or average	98	1,047	963	634	270	2,914	$0.70	$0.72	$1.42
Western Division.	Brunswick	3	92	11	..	37	140	.03	.34	.37
	Centralia	1	15	15	..	..	30	..	.39	.39
	Council Bluffs	7	63	68	64	..	195	.52	.85	1.37
	Des Moines	..	48	78	..	21	147	2.59	.76	3.35
	Excelsior Springs	1	27	18	29	..	74	..	.17	.17
	Ferguson	1	60	30	..	..	90	..	.13	.13
	Kansas City	10	79	70	60	..	209	.51	1.35	1.86
	Luther	14	79	184	281	..	544	.47	.71	1.18
	Moberly	75	490	412	180	23	1,105	1.82	1.23	3.05
	Moulton	7	106	167	..	39	312	.48	.15	.63
	Salisbury	1	15	15	..	..	30	..	.39	.39
	So. Ottumwa	3	52	46	..	..	98	..	.35	.35
	Stanberry	12	160	133	59	54	406	.66	.91	1.57
	St. Charles	1	56	27	..	4	87	..	.16	.16
	St. Louis	24	426	47	247	..	720	.38	.91	1.29
	Albia	1	30	..	..	42	72	..	.17	.17
	Hamilton	1	6	37	..	15	38	..	.20	.20
	Mayville	1	26	1	..	9	36	..	.16	.16
	Total or average	163	1,830	1,359	920	244	4,353	$0.81	$0.82	$1.63
Recap.	Buffalo Division	76	558	1,183	325	..	2,066	1.15	.73	1.88
	Detroit Division	55	668	878	823	1	2,370	.62	.54	1.16
	Eastern Division	98	1,047	963	634	270	2,914	.70	.72	1.42
	Middle Division	244	1,732	2,577	985	63	5,357	1.36	1.12	2.48
	Western Division	163	1,830	1,359	920	244	4,353	.81	.82	1.63
	Grand total or average	636	5,835	6,960	3,687	578	17,060	$0.98	$0.84	$1.82

Lehigh Valley.—The figures are the average per locomotive for handling, repairs and supplies at the five principal terminals of the line, for the year ending June 30, 1903.

	No. of locos.	Handling.	Repairs.	Supplies.	Total per loco.
Buffalo	18686	$1.87	$8.84	$0.48	$11.19
Manchester	13952	1.71	1.46	.22	3.39
Sayre	28875	1.59	4.28	.74	6.61
Coxton	25289	1.99	2.03	.45	4.47
Packerton	23649	2.14	1.49	.32	3.95

Chicago, Milwaukee & St. Paul.—The following costs per engine handled for six of the principal roundhouses on the line for six months, from March to August, 1903, inclusive, represent the total cost of maintaining each house, divided by the total number of engines handled; it does not, however, include the wages of locomotive despatchers or ash-pit men.

	Mar.	April.	May.	June.	July.	Aug.
West Milwaukee	$2.18	$2.41	$2.50	$2.40	$1.96	$2.47
Savanna, Ill.	3.24	3.19	3.24	3.40	2.87	3.12
Marion, Iowa	1.68	2.10	2.35	2.28	2.10	1.96
Western Ave. (Chicago)	2.19	2.18	2.15	2.19	2.20	2.20
Ottumwa Jct., Iowa	3.59	3.47	3.53	4.38	3.56	3.71
La Crosse, Wis.	1.87	1.46	1.81	1.53	1.85	1.69

Lake Shore & Michigan Southern.—The cost of all roundhouse expenses, including skilled mechanics on ordinary running repairs, for the first six months of 1903 averaged $3.60 per locomotive handled. Exclusive of skilled mechanics the average was $1.73.

Oregon Short Line.—Average expense for all terminals, $1.60 per engine. A day and a night hostler, with helpers, are kept at all points where engines are handled, other than branch lines, so that points handling a large number of engines average less per engine than where the number is small.

Missouri Pacific.—Monthly reports are made of the labor cost of handling locomotives, the following being the statement for April, 1903:

Number handled.	Roundhouse foremen.	Hostlers and helpers.	Callers.	Wipers.	Boiler-washers, flue-borers, fire cleaners, laborers.	Total cost.	Av. cost per engine.
3151	$2,182	$10,466	$2,238	$9,192	$19,997	$44,077	$1.40

Atlantic Coast Line.—Cost per 100 miles computed from July, 1903, performance is: Handling, 63 cents; repairs, $3.23; supplies and tools, 28 cents; fuel, $9.99.

Atchison, Topeka & Santa Fe (Western Grand Division).—The following figures for May and June, 1903, include only the wages of hostlers and their helpers, wipers, ash pitmen and callers. The wages of roundhouse foremen, sand dryers, roundhouse sweepers, etc., and of locomotive inspectors are not included. The last item is regarded as belonging to repair charges.

	May. Number handled.	May. Cost per loco.	June. Number handled.	June. Cost per loco.
Dodge City	675	$1.88	584	$2.20
La Junta	1043	2.48	941	2.63
Pueblo	1310	2.04	1153	2.41
Trinidad	717	1.48	526	2.05
Raton	1218	3.03	1160	3.28
Las Vegas	1102	2.19	916	2.33
San Marcial	352	1.98	315	2.07

Burlington & Missouri River.—The figures submitted show the average cost by months of roundhouse service per locomotive for handling for the first quarter of 1903. The figures are the average for 26 roundhouses on the system and include, for each engine handled, part or all of the following operations: Watering, coaling, wooding, sanding, cleaning fires, turning, housing, inspecting stack, inspecting engine, wiping, washing boiler, oiling trucks, firing up and calling engine crew. The figures are: January, $2.42; February, $2.43; March, $2.47.

Chesapeake & Ohio.—Reports are gotten out each month and are compared with the figures for the previous month. In its classification of accounts the road has one entitled "Roundhousemen," which includes the wages of hostlers, callers, watchmen, and all other employees engaged in wiping, cleaning, firing up, dumping, boiler washing, cleaning fire-boxes, watching and despatching locomotives; also other roundhouse employees, such as smokestack inspectors, roundhouse cleaners, ash-pit cleaners, clinker dumpers, table turners, etc. Where any of these men are engaged in other classes of service, chargeable to other operating expense accounts, their time is so charged. Should a roundhouse employee be engaged in roundhouse work for

NORFOLK & WESTERN.

	Number handled. 1903.	1902.	Repairs per engine. 1903.	1902.	Supplies per engine. 1903.	1902.	Watching and hostlering per engine. 1903.	1902.	Total cost per engine. 1903.	1902.
January	15822	13684	$1.26	$1.04	$0.01	$0.01	$0.50	$0.40	$1.77	$1.45
February	13662	12413	1.30	1.05	.01	.01	.54	.41	1.85	1.47
March	16613	13652	1.20	1.00	.01	.01	.50	.41	1.71	1.42
April	16244	13592	1.33	.98	.01	.01	.50	.39	1.84	1.38
May	16438	14265	1.36	.96	.01	.01	.51	.39	1.88	1.36
June	16824	12613	1.37	1.06	.01	.01	.51	.46	1.89	1.53

a part of the day and in work charged to other accounts for the rest of the day, the distribution is half and half.

	June.		July.	
	No. locos.	Av. cost.	No. locos.	Av. cost.
Newport News	717	$0.64	599	$0.66
Fulton	951	1.19	966	1.26
Gladstone	558	.93	531	.98
Richmond	754	1.70	720	1.70
Charlottesville	601	1.29	711	1.08
Clifton Forge	1,981	1.49	2,089	1.42
Ronceverte	227	.81	274	.82
Hinton	996	1.67	1,050	1.68
Thurmond	583	.78	586	.80
Hendley	779	.62	822	.64
Huntington	709	1.13	915	1.41
Ashland	590	.92	604	.95
Russell	735	.96	720	.98
Lexington	670	.93	697	.96
Covington	1,107	1.04	1,074	1.11
Totals	11,900	$1.14	12,358	$1.17

Seaboard Air Line.—Monthly statements are made, giving the number of engines handled at all terminals and the total labor charge and cost per engine under the three following heads: Repairs, supplies, roundhouse men. The figures below are for June, 1903, with the total labor costs at each point omitted.

	No. engine.	Repairs per engine.	Supplies, labor per engine.	Round-house-men per engine.	Total cost per engine.
Portsmouth	360	$1.09	$0.04	$0.75	$1.87
Norlina	34	..	..	.74	.74
Weldon	279	..	..	.23	.23
Hermitage	329	1.06	.02	.57	1.55
Henderson	123	..	..	.54	.54
Durham	128	..	..	.75	.75
Raleigh	667	3.09	.04	1.22	4.35
Hamlet	624	1.29	.03	.55	1.87
Wilmington	90	..	.03	.57	.65
Columbia	398	.64	.03	.42	1.08
Monroe	441	.44	.03	.47	.94
Charlotte	325	.32	.03	.23	.58
Abbeville	456	1.43	.07	1.06	2.56
Howell's	304	.68	.05	.94	1.67
Winder	95	..	..	.42	.42
Savannah	561	1.83	.06	1.25	3.14
Americus	321	1.21	.04	1.07	2.32
Montgomery	282	..	..	.23	.23
Fernandina	332	2.19	..	.48	2.67
Tallahassee	293	1.12	.02	.34	1.83
Live Oak	31	..	..	.17	.17
Lake City	111	..	..	.09	.09
River Junction	91	..	..	.44	.44
Waldo	325	1.50	..	.23	1.73
Tampa	266	1.63	..	.49	2.12
Orlando	97	.75	..	.31	1.00
Wannee	30	.37	..	.37	.74
Ocala	162	..	..	.06	.06
Cedar Key	55	..	..	.32	.32
Average	7,615	$1.13	$0.03	$0.64	$1.80

Following are the instructions which are issued covering the labor which is to be included in the monthly statements:

Each engine coming in and going out of a terminal point, if it received attention from roundhouse force, should be counted as one engine, whether or not it crosses the turntable.

Each switching engine that receives attention at the roundhouse at the end of the day should be counted as one engine.

A switching engine working both day and night and receiving attention both in the evening and morning, should be counted as two engines.

An engine coming off of a run and taken by a hostler and placed in roundhouse or on storage track, and going out again without receiving repairs, is equivalent to an engine receiving attention and should be counted as one engine.

An engine simply coming in to take water or coal, or both, and immediately going out again, should not be counted.

An engine coming into a terminal point for repairs, and going out several days, or longer, thereafter, should be counted as one engine on the day on which it goes out for service.

A prominent eastern road having 685 miles and 476 locomotives gives figures for 31 points employing 231 men and handling 13,388 locomotives monthly. The average cost of handling is 78.8 cents; running repairs, $2.83; coal, $8.32; supplies, 43 cents; water and water stations, 70 cents.

One of the western systems with over 7,000 miles of track and 1,263 locomotives, which does not keep separate records of the kind asked for, compiled some figures. The officer sending the information says: "In getting this information together I find $1.80 per engine is about right. This includes the despatcher and helper, clinker-pit men, fire-box cleaners, ash-pan cleaners, flue cleaners, wipers, sand-house men and fire-up men. The coal-house men, not being under the mechanical department, are not included in the figure given. I cannot give you information in regard to supplies and repairs, as these are such variable quantities. The cost of handling varies considerably at different points. At some places we are able to employ cheap labor, while at others only high-priced help can be had."

Another well-known western line with something over 1,300 miles of track and 312 locomotives sent a set of six diagrams giving the roundhouse costs for nine principal points on the road for the year 1902. The sheets are ruled in ⅝-in. spaces, those along the horizontal axis each representing a roundhouse, while the ordinates represent costs. A horizontal straight line across a ⅝-in. space at the proper cost height denotes the expense at a given roundhouse for the item represented by the diagram. The total cost per engine handled is the entire pay roll divided by the number of engines handled. The number of engines "out" is counted as the number handled; two handlings of one switch engine is considered one engine handled.

The first sheet contains the coal and hostling diagrams. The latter item includes sand drying, taking water, boring flues, knocking fires and getting tools and cans off the engine. Another sheet gives respectively general expenses, washouts, wiping and cinders, per engine handled, in separate diagrams. The first includes the wages of roundhouse foremen, call boys, clerks, storekeepers and laborers for loading and unloading material, cleaning roundhouses and such work not directly chargeable to other accounts. Washouts usually include filling up. Wiping includes only the cost of wiping above and below the running-board; that is, the wiping that is not done by the fireman. Cinders includes only the cost of cleaning out the cinder pit.

Repairs per engine handled is shown on another sheet. It includes the wages of machinists, blacksmiths and boilermakers and their helpers, together with air-brake repairmen, truck men, carpenters and all labor directly chargeable to repairs.

Another sheet contains two diagrams, one of which shows the total cost per engine handled, and the other the total of all items except repairs. This latter diagram runs pretty uniformly at about $2.25.

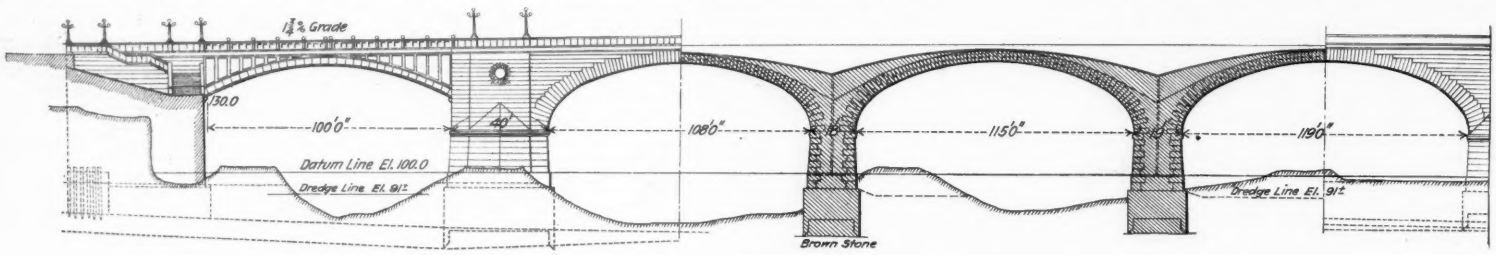
The officer sending the figures says: "In general it may be said that under our distribution the cost for handling modern heavy engines on this road is as follows:

General	$0.70
Washout	.17
Wiping	.10
Cinders	.13
Hostling	.80
Coal	.35
Total	$2.25

Wiping per engine handled is entirely too low and should be at least twice as high to keep engines reasonably clean; in which case the total cost, exclusive of repairs, would be about $2.35. The average roundhouse repairs per engine handled, for modern heavy engines, will run about $2.50 on this road, and this is about 30 per cent. higher than for our old 18-in. moguls. Our engines average 125 miles run per engine handled."

Another sheet shows cost of coal per ton, wiping per engine wiped, and washing out per engine washed.

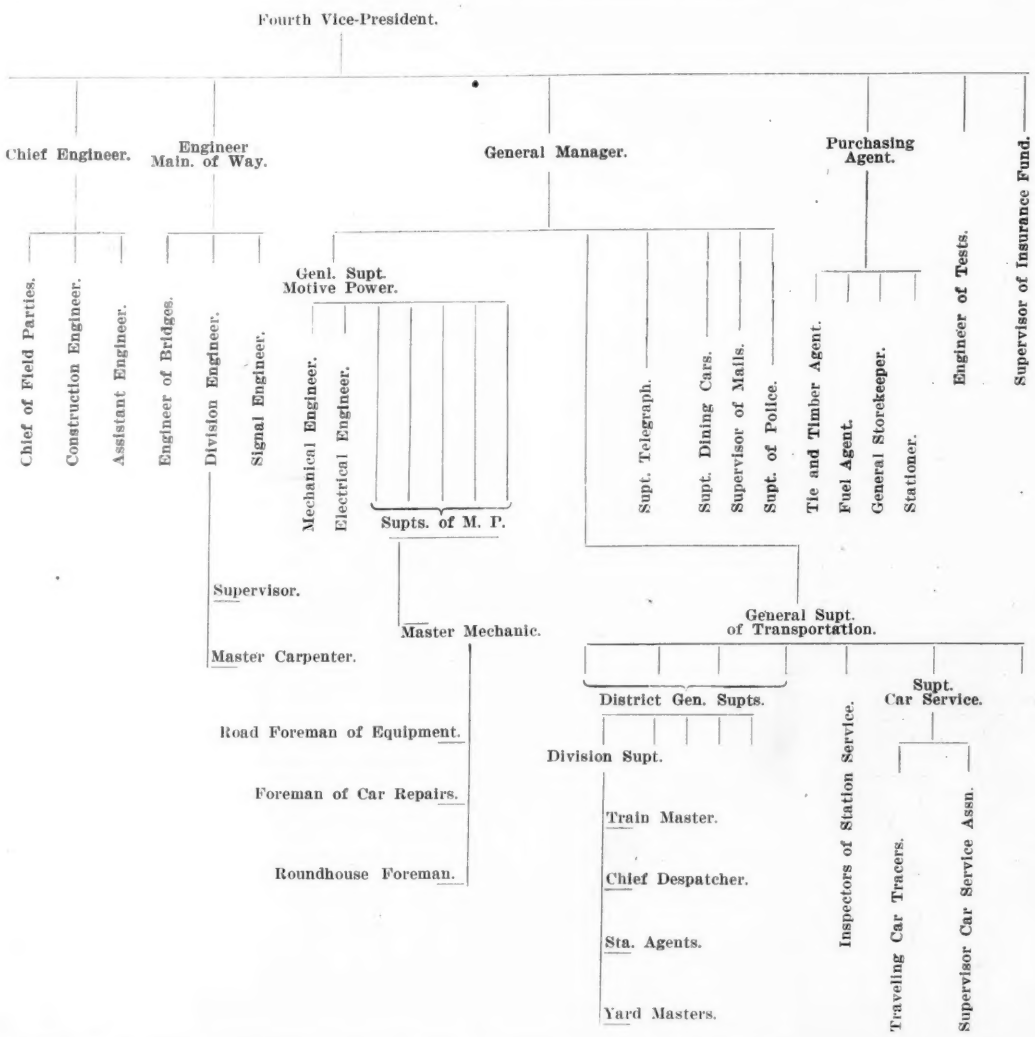
Another sheet shows the average amount of coal put on each engine at each house.



Part Side Elevation and Longitudinal Section of West Half of Stone Bridge Over the Connecticut River at Hartford.

The Rock Island System's New Organization.

In common with most western railroads, the operating organization of the Rock Island has been divisional, although the line of distinction from a departmental organization had not always been sharply drawn. But with the great traffic increases of recent years, involving the constant solution of new problems in operation and demanding at the same time rapid strengthening and rebuilding of the lines, it is exceedingly difficult to find men who are fitted by their previous experience to achieve the highest results simultaneously in both kinds of work. The tendency of men specially trained in operating has been to overlook possibilities of development in maintenance work; the training of those specially experienced in road engineering has not well qualified them to see and to solve new traffic problems. At the time Mr.



Loree assumed the presidency of the system, it was felt that the existing organization, although a successful one, was not achieving the maximum results possible, and a departmental organization, pure and simple, has now been devised, and will be put into effect as rapidly as it can be worked in.

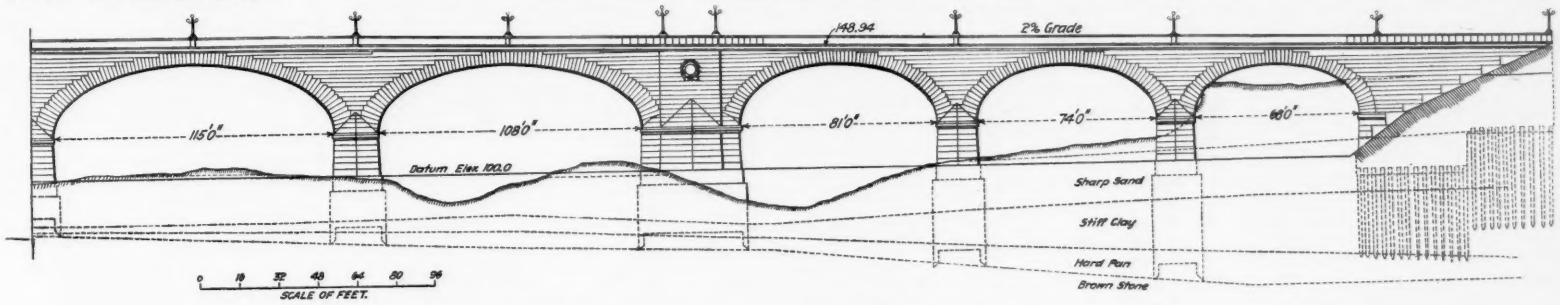
This organization is shown on the accompanying chart. The Fourth Vice-President is head of the operating department, and six men report to him, of whom four only, the General Manager, Chief Engineer, Maintenance Engineer and Purchasing Agent, will demand much of his time. It is at once apparent, following out the diagram, that the General Manager will be relieved of many cares in his supervision, owing to the creation of a new officer, the General Superintendent of Transportation, who reviews the work of the district superintendents, each of whom formerly reported to the General Manager, and who also has charge of station and car service. The Engineer of Maintenance of Way also reports to the General Manager at the present time, instead of to the Fourth Vice-President direct.

According to the old schedule, the division engineers reported to the division superintendents, who were under the authority of the district general superintendents. The present organization, which places them directly in charge of the Engineer of Maintenance of Way, would seem to effectively separate the responsibility of maintenance from that of operation. The maintenance engineer also finds his authority increased by the addition of the engineer of bridges and of signals, who previously reported to the Chief Engineer. The Chief Engineer, therefore, is relieved of all responsibility except that incident to new construction, which is his proper field, and is not directly interested in the maintenance of the line after he builds it, while the General Manager is enabled to devote almost his entire attention to the General Superintendent of Motive Power and the General Superintendent of Transportation, although the superintendents of telegraph, dining cars, police and the supervisor of mails also report to him. The diagram of the organization makes the details sufficiently plain so that further explanation is unnecessary.

Stone Highway Bridge Over the Connecticut River at Hartford.

The Board of Commissioners of the Connecticut River Bridge and Highway District has let the contract for the construction of the new stone highway bridge over the Connecticut River to be built at Hartford. It will be 1,185 ft. long and 80 ft. wide between parapets and will consist of a 100-ft. Scherzer rolling lift double draw span over the canal which runs along the west bank of the river and eight semi-elliptical, granite-faced arches. The site selected will connect Morgan street, in Hartford, to the Causeway, or Hartford avenue, in East Hartford, being substantially the same location as that formerly occupied by the old covered wood bridge which was burned about 12 years ago. The temporary bridge, erected shortly after the old bridge was burned and which is now in use, is located some distance up stream from the site of the new structure. The contract price for the masonry and foundations was $1,369,520, and the total estimated cost of the completed bridge is $1,600,000. In addition to this the approach to the Hartford end will require extensive changes in the location and grades of existing streets and in the yards and tracks of the New York, New Haven & Hartford. This will cost an additional $1,000,000.

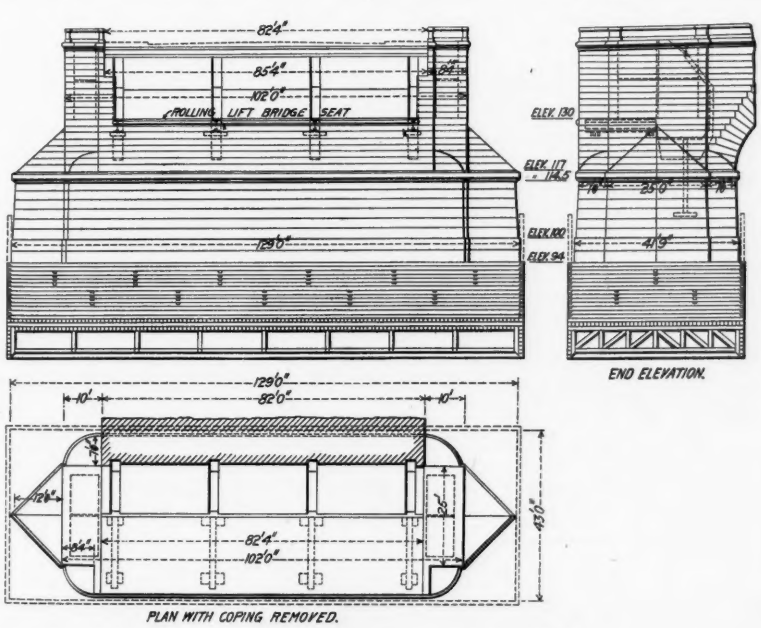
The accompanying drawing of the bridge in part section and elevation shows its general dimensions and appearance. The stone arches are divided into two groups of five and three each, the three arches nearest the east bank being of much smaller span than the others. In building the bridge the five long span arches will be centered first. Piers 1 and 6, it will be noted, are built much heavier than the others and will serve to take the thrust of the completed arches while the other three are being erected. The span and rise of the arches starting from the west end are respectively: Span 108 ft., rise 27 ft.; span 115 ft., rise 28.75 ft.; span 119 ft., rise 29.75 ft.; span 115 ft., rise 28.75 ft.; span 108 ft., rise 27 ft.; span 81 ft., rise 25.11 ft.; span 74 ft., rise 22.94 ft.; span 68 ft., rise 21.08 ft. The widths of the piers in the same order are: 40, 18, 19, 19, 18, 40, 16 and 15 ft. each respectively.



Side Elevation of East Half of Stone Bridge Over the Connecticut River at Hartford.

The west abutment foundation will be put in with an open coffer dam and is to rest on hard-pan or other suitable material at the depth necessary to secure a solid footing. After the surface has been leveled off over the entire area of the foundation the tongued and grooved sheet-piling of the coffer dam will be driven into the hard-pan, using a water jet or shoeing the piles if necessary. The interior material will then be excavated by pumping or dredging. Below El. 94.00, all concrete which is deposited in the open air is to be a 1-2-4 mixture. In no case will concrete be deposited in water above El. 90.00 and below that any concrete deposited in water must contain an excess of 25 per cent. of cement over the open-air mixture.

The foundations for all of the piers will be put down with pneumatic caissons extending down to rock, as shown, and completely filled with concrete, including the working chamber. The same mixture of concrete for both open air and water deposition will be used in the pier caissons as in the coffer dam foundation of the west abutment. The east abutment will be put down with an open coffer dam and will rest on piles driven into the stiff clay which is found at that point. After clearing the site of the foundation the sheet piling will be driven well into the clay and the excavation carried down to El. 92.00. The foundation piles, about 550 in number, will then be driven to a suitable depth and cut off at El. 95.00. Concrete of a 1-2-4 mixture will then be laid in uniform layers from El. 92.00 to El. 98.00. The general characteristics of the soil formations into which the foundations will be sunk are shown in the drawings. The old wooden bridge which stood on this site rested on rough stone piers and abutments built on timber grillage supported on piles filled in and protected with riprap. The west abutment is still standing, but the river piers and east abutment have been removed to low water mark, the foundations being still more or less in place. This material will all have to be removed in sinking the foundations for the new bridge.



Plan and Elevations of Pier No. 1.

Above the foundations and below the springing line the piers are to be faced with heavy granite ashlar in 28-in. and 30-in. courses, laid in alternate courses of headers and stretchers. The nosings have an angle of 45 deg. on both the up-stream and down-stream faces. The backing in the piers and abutments will be a 1-2½-5 concrete (no stone over 1½ in.), in which larger stones may be embedded. It will be leveled up even with the top of each course of facing and the facing will not be set more than one course ahead of the backing. Each course will be backed up substantially in the following order: Over the bottom a 6-in. layer of 1-2½-5 concrete will be laid and well tamped; on this surface, before the concrete sets, flat, clean, quarry-split sandstone is to be laid with the best bed down and with no part of the stones within 10 in. of any other stone or of the facing. They are to be laid uniformly over the whole surface so that there will be no breaks or cavities and no stone is to project above the course being leveled. All space around and over these stones will be filled with 1-2½-5 concrete, tamped in solid and leveled off to the top of the course. Where stone arch rings spring from the top of the belt course, no backing stones will come nearer than 2 ft. below this level and the concrete under the first voussoir for this depth will be a 1-2-4 mixture with 1-in. stones.

In the arches, all the voussoirs are to be the best selected granite, laid with the grain or rift of the stone radial and running transversely with the bridge. Face voussoirs extend the whole depth of the arch ring in one piece and bond with the interior voussoirs at least 16 in. The interior voussoirs will be laid in alternate header and stretcher courses, with the header extending the full depth of the arch ring. In each group of arches the setting of voussoirs is to proceed in regular order and be kept at the same height in each arch. At least a half of the width of each group of arches is to be completed and centers struck during one season between spring freshets and the first running ice in the fall. The interior voussoirs are to be backed up with 1-2-4 concrete, using 1-in. stone. This will be laid in continuous layers transversely between and around the headers and completely fill the space between the face voussoirs. The engineer may require the work to proceed day and night in any one arch ring in order to make it monolithic.

All of the face work on the spandrel walls, piers and abutments above the belt course, El. 117.00, will be "fine pointed" face, granite ashlar. This work will be alternate header and stretcher work, with all the belt courses laid as stretchers. The stones are to be set in 1-3 mortar. The backing between spandrel walls is 1-3-6 concrete in which large stones may be bedded in the same way as described for the backing in the piers and abutments. The whole back of arches, top of spandrel backing, back of spandrel walls and retaining walls will be waterproofed by first finishing off the surface with a layer of 1-1 cement mortar troweled smooth. Over this is to be laid the waterproofing, consisting of three layers of thin tar paper, swabbed together with hot coal tar pitch and mopped with hot tar after laying. As soon as it has hardened a 6-in. layer of clean sand will be spread over the top. In each pier provision is made for a tile drain to carry off the water from the back of the arches and from the catch basins in the roadway, and discharge it in the river, below El. 101.00.

The space up to the underside of the roadway pavement is to be filled with clean sand, washed in in layers and in and on this will be laid all pipes and conduits and the double-track street-car line of 9-in. grooved girder rail. The roadway is 60 ft. wide, flanked by 10-ft. sidewalks on each side. All wires and pipes crossing the bridge are to be laid in conduits under the 6-in. concrete sidewalks. The roadway and the space between the car tracks will be asphalted.

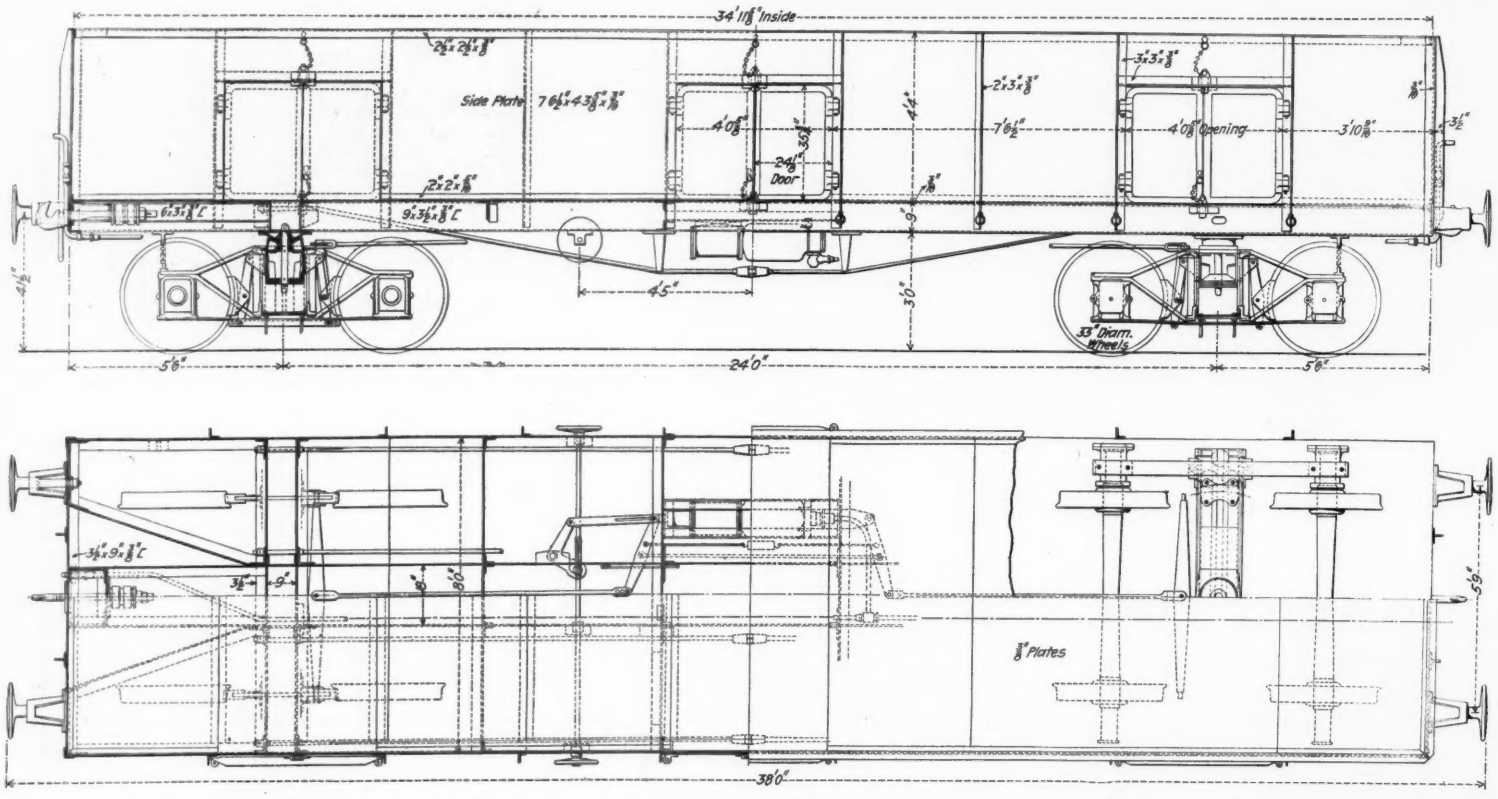
The following is an approximate list of quantities required:

Excavation and grading for abutments	20,000 cu. yds.
Dredging and grading for piers in the river	35,000 cu. yds.
West abutment foundation	1,800 cu. yds.
East abutment foundation	1,000 cu. yds.
Piles for east abutment foundation	550
Concrete in caisson pier foundations	23,300 cu. yds.
Granite ashlar below springing line	6,300 cu. yds.
Concrete backing below springing line	16,000 cu. yds.
Ashlar above springing line	3,000 cu. yds.
Concrete backing above springing line	16,000 cu. yds.
Granite voussoirs	10,000 cu. yds.
Arch ring concrete	9,500 cu. yds.
Granite parapets and posts	8,000 cu. ft.
Waterproofing	90,000 sq. ft.
Sand filling below roadway	16,000 cu. yds.
Granite curb	2,000 lin. ft.
Granolithic sidewalks	19,100 sq. ft.
Asphalt roadway pavement	6,800 sq. yds.

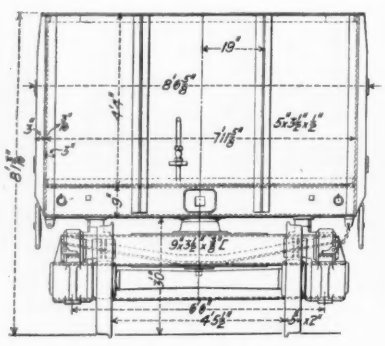
The design of the bridge was worked up by Edwin D. Graves, Chief Engineer, in conjunction with A. P. Boller, of New York, Consulting Engineer, and Edmund M. Wheelwright, of Boston, Consulting Architect. McMullen, Weand & McDermott, of New York, are the contractors for the masonry and they have already begun work on the foundations.

We are indebted to Mr. Henry W. Hodge, of Boller & Hodge, New York, for the drawings and information.

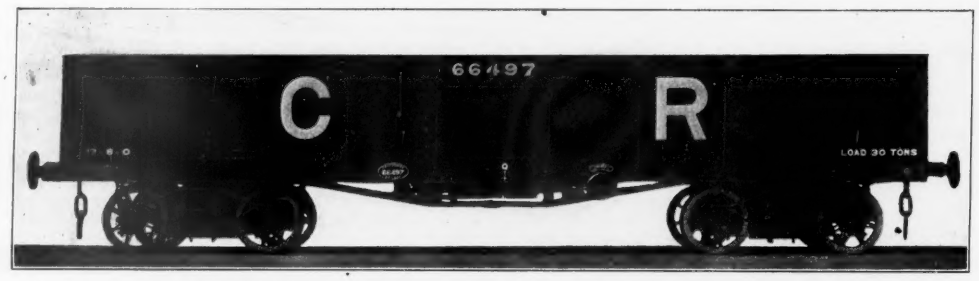
The Central Iron & Steel Company, Harrisburg, Pa., has resumed operation at its mill, No. 2, which has been shut down for about three weeks.



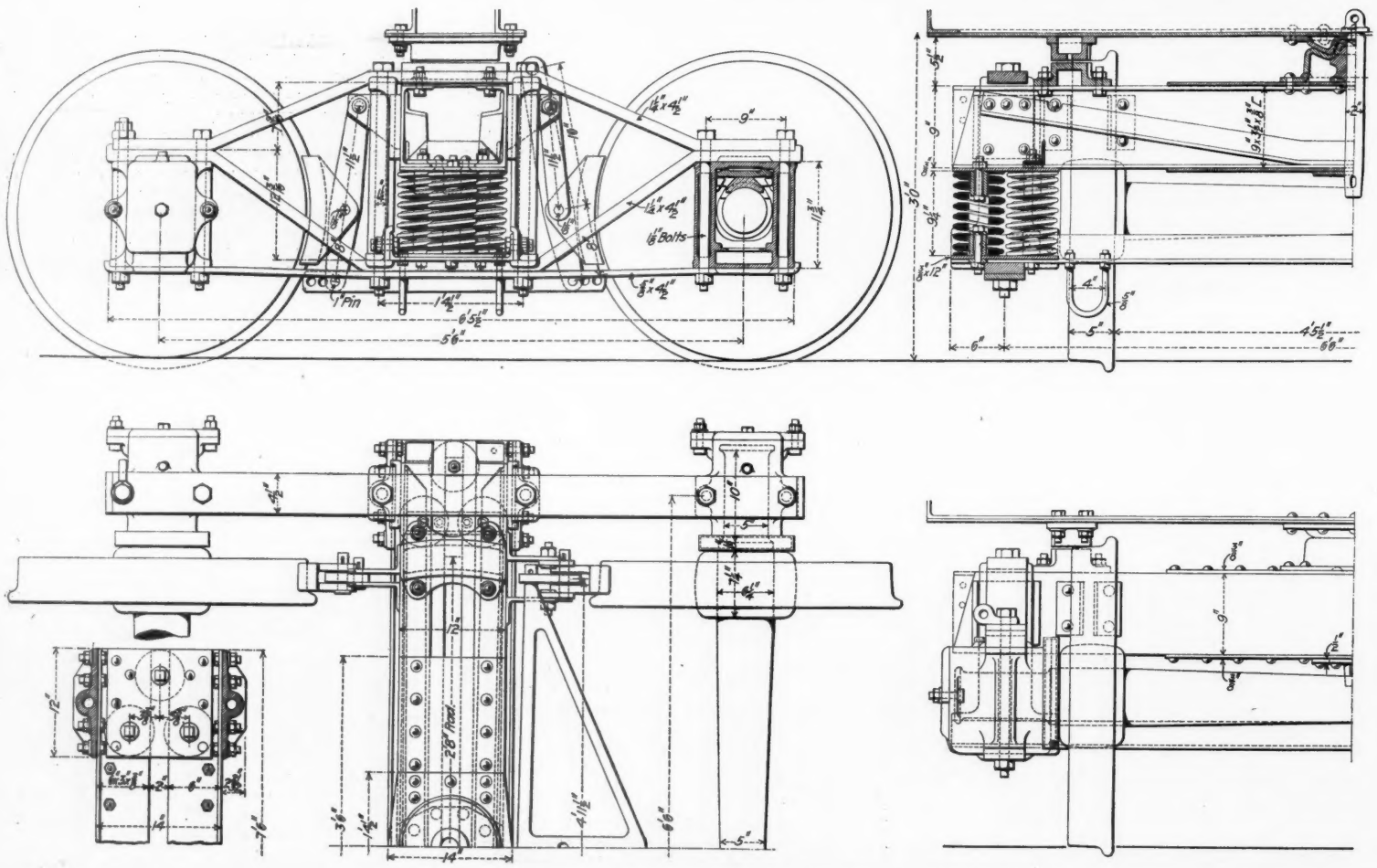
Plans and Side Elevation of Standard 30-Ton Steel Gondola—Caledonian Railway of Scotland.



End Elevation of 30-Ton Gondola.



30-Ton Standard Gondola With Trussed Underframe and Arch-Bar Trucks.

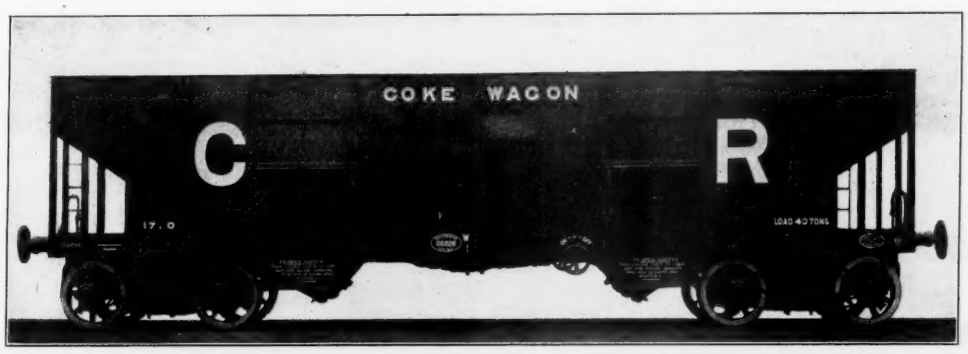


Details of Standard 30-Ton Arch-Bar Truck—Caledonian Railway of Scotland.

Steel Cars on the Caledonian Railway of Scotland.

The Caledonian Railway handles an abnormally heavy miscellaneous and mineral freight traffic between the various ports on the coast reached by its lines and the large number of collieries, iron and steel works and other important industrial plants situated inland. In common with other Scotch and English railroads its equipment has for many years past been of an exceedingly low carrying capacity; out of a total of 63,600 cars owned, 43,800 have a capacity varying from 6 to 8 tons. Some time ago it was decided to make experiments with higher capacity cars to replace those of small capacity with a view to handling its "wholesale" traffic by "wholesale" methods, increasing the train-loads and thereby effecting economies in working expenses. A contract for 50 30-ton steel gondolas was divided between the Leeds Forge Co., in England, and the American Steel Foundry Co., of St. Louis. These were the first high capacity steel cars introduced in Great Britain and so successful were the results obtained from their use that a further order was placed for 300 more 30-ton cars. This lot was divided among five English builders: The Leeds Forge Co.; Hurst, Nelson & Co., Motherwell; W. R. Renshaw & Co., Stoke-on-Trent; Metropolitan Carriage & Wagon Co.; Birmingham Railway Carriage & Wagon Co., and R. Y. Pickering & Co., Wishaw. The Leeds Forge Co., which controls the Fox pressed steel patents in England, was allowed to supply pressed steel underframes and trucks on the 100 cars built by it, but in all other respects the 300 cars

30-Ton Standard Gondola With Pressed Steel Underframe and Fox Trucks.



40-Ton Steel Hopper Coal and Coke Car.

were built in accordance with the standard 30-ton car design, developed by Mr. J. F. McIntosh, Locomotive Superintendent of the railroad. A number of these cars have also been built in the company's shops at St. Rollox, Glasgow, bringing the total number now in service up to nearly 600.

The accompanying illustrations from photographs show one of the standard 30-ton cars as built by the Leeds Forge Co., with pressed steel underframe and Fox trucks, and also one of the cars built at the company's shops, which conforms to the original design in having a rolled steel underframe and diamond arch-bar trucks. In all other respects the two cars are alike. The drawings show the construction of the cars with rolled steel underframes and the arch-bar trucks on which they are mounted, this design having also been adopted as standard.

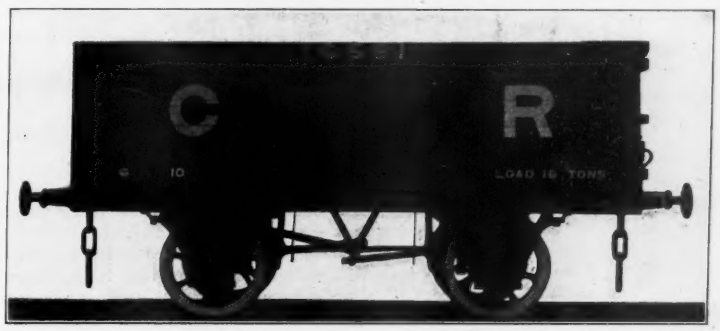
The general dimensions of the car are: Length over buffers, 37 ft. 10 in.; width over all, 8 ft. 6⅜ in.; height from top of rail, 8 ft. 2 in.; inside length, 35 ft.; inside width, 8 ft.; inside height, 4 ft. 4 in.; cubic capacity, full load, 1,208 cu. ft.; light weight, 30,000 lbs. Side, center and end sills are 9-in. channels. Contrary to the usual practice in this country, the bolsters, instead of the center sills, are made continuous over the center plate, two 9-in. channels being used for this purpose. The center sills are cut off inside the bolsters and a short piece of 9-in. channel is inserted between the webs of the two bolster channels to act as a spacer. Between the end sill and the bolster two 6-in. channels are put in for draft sills and the draw hook springs bear against a plate riveted between the draft sills just back of the end sill. The buffers on the ends of the car are backed up with a diagonal brace extending back to the bolster.

On each side of the car are three double doors, hinged at the sides and opening outward. They have an opening 4 ft. ⅝ in. wide by 35¾ in. high, and are held closed with a simple form of catch at the top and bottom. The sides and floor are ⅜-in. plates and 2-in. x 3-in. x ⅜-in. angles are used for side stakes. Four truss rods are hung under the car body, two just outside the center sills and two just inside the side sills. They extend through the bolsters and are fastened there with a nut and washer. The queen-posts bear on angle cross-ties on each side of the center of the car.

The design of arch-bar truck on which these cars are mounted shows some interesting adaptations of American practice. The bolster is built of two 9-in. channels placed with the flanges in and riveted together with the top and bottom cover plates, 3 ft. 6 in. long, over the center and with the spring caps and a short piece of angle iron at the ends. A stiffening angle is riveted on the inside of each channel, giving something of the effect of a truss bolster. It will be seen from the drawings that the three bolster springs on each side are coiled from a peculiar section of rectangular rod which has a rib on its outer edge. Any or all of the bolster springs may be easily removed by jacking up the bolster and taking off the nuts holding the separate spring lugs. Journals, 5 in. x 10 in., are turned on the axles; this corresponds more nearly to the size of journals used on 100,000-lb. cars in this country than to the 4¼-in. x 8-in. journals commonly used for cars of 60,000 lbs. capacity. The spring plank is built up of two angles, 6 in. x 3 in. x ⅜ in.

The brake rigging is an ingenious combination of English and American practice, being a combination of the Westinghouse quick-acting air-brake and a powerful hand screw brake operated from the side of the car with an inside hung arrangement of the brake shoes. The peculiarity of the truck gear is the use of a single brake-beam with double bottom rods and truck levers. The shoes on the pair of wheels nearest the end of the car are hung on the dead levers pivoted from hanger brackets above. These brackets are simply two pieces of angle iron riveted on the side of the bolster. The bottom or compression rod on each side is connected to the bottom end of these combination dead levers and hangers and runs back under the spring plank to the bottom ends of the two live truck levers which are fastened to the shoes on the other pair of wheels. These shoes, however, are supported by separate hangers suspended from brackets riveted to the side of the bolster also. The top ends of the two live levers are connected together with a forged truss beam and the reach rod from the cylinder lever is pin connected through the strut of this beam. A pair of ⅝-in., U-bolt safety hangers, to support the bottom rods in case of breakage of the fixed hangers, are bolted under the spring plank on each side of the truck. On each side of the car is a hand wheel, mounted on a shaft which extends across, under the sills. This shaft is threaded for a part of its length in the center and on it is a threaded sleeve which is carried on one arm of a bell-crank pivoted to a bracket mounted on one of the center sills. The other arm of the bell-crank is fastened to a slotted link. When the hand brakes are not in operation the connection pin between the push rod and the cylinder level slides in the slot in this link, being up against the end of the slot when the brakes are released and the piston in its normal position. To apply the brakes by hand, the wheel on the end of the shaft is revolved and this moves the threaded sleeve along the shaft, turning the bell crank and pulling on the slotted link. The effect is then the same as when the cylinder push-rod is forced out by air.

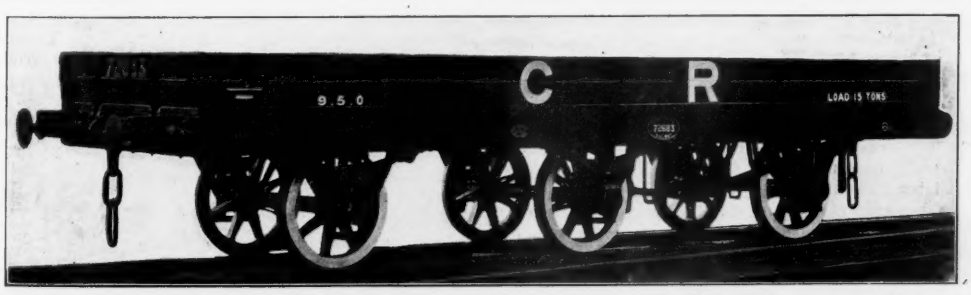
In addition to these 30-ton cars, some of which are being used in general merchandise traffic, the Caledonian has recently built a number of hopper bottom cars at its St. Rollox, Glasgow works. These cars were also designed by Mr. McIntosh and are being used for hauling coke from the Scottish collieries to Cumberland. They have a capacity of 40 tons of coal or 28 tons of coke and are provided with two double doors in the bottom and two folding doors on each side above the sills. The drop doors in the bottom are arranged so that the two doors to each hopper operate simultaneously by manipulating a single shaft which runs across the car and may be worked from either side. The folding doors in the sides are similar to those in the gondola cars. The general dimensions of these cars are: Inside length, 34 ft. 11⅜ in.; width inside, 7 ft. 11½ in.; height from top of rail, light, 10 ft. ¾ in.; length over end sills, 35 ft.; length over buffers, 38 ft.; center to center of trucks, 26 ft. 6 in.; truck wheel-base, 5 ft. 6 in.; diameter of wheels, 33 in.; size of journals, 10 in. x 5 in.; width of bottom doors, 3 ft.; width of side doors, 4 ft. ⅜ in.; height of side doors, 2 ft. 6 in.; light weight, 38,080 lbs. They are equipped with Westinghouse quick-acting brakes and hand screw brakes with the same arrangement of connections to the trucks as that for the 30-ton gondolas. The trucks are the diamond arch-bar type, of the same general design as that illustrated, but with eight bolster springs, four on each side, instead of six. These are among the first hopper cars to be adopted by any of the Scotch railroads. Their introduction by the Caledonian is one of the steps now being taken to break up a monopoly enjoyed by a competing road in the coal and coke traffic between the furnaces in the West Cumberland district and the South Durham coal fields on which they depend for fuel supplies, by reducing the cost of transportation and of handling the load at terminals.



Standard 16-Ton Car for General Service.

In an address at a recent meeting of the stockholders of the Caledonian, the Chairman of the Directors, Sir James Thompson, referred to the fact that the loading and unloading devices at many of the Scotch collieries and terminal docks at the seaports were not adapted for dealing with the larger types of rolling stock. To make the necessary changes would involve the expenditure of enormous amounts of money in rebuilding docks and tipples. To provide a type of car adapted to the existing conditions which would have a light tare weight, the design of 16-ton, four-wheel car with wood body and steel underframe, was introduced and may properly be called the standard cars on the system. They are suitable for use on any part of the line and are easily and quickly loaded and unloaded at the mines, furnaces and docks. Large numbers of them have been built by outside builders and one is shown in the accompanying illustration from a photograph. They have one end door, hinged at the top to the crossrail and opening the full width of the car and also folding double doors in each side in the center which are 4 ft. 1 in. wide and 3 ft. high. Hand lever brakes only are applied. The principal dimensions are: Inside length, 16 ft. 1 in.; inside width, 7 ft. 7 in.; height of side, 3 ft. 11 in.; length over buffers, 19 ft. 10 in.; wheel-base, 8 ft. 6 in.; diameter of wheels, 38 in.; height of side from top of rail, loaded, 7 ft. 11⅜ in.; size of journals, 4½ in. x 9 in.; light weight, 14,560 lbs.

Another type of car in use on the Caledonian, of which a large number have been built by Hurst, Nelson & Co.,



Low Side, 6-Wheel Gondola for Carrying Rolled Steel Sections and Billets.

Motherwell, is the low-side, 6-wheel, gondola shown in one of the illustrations. They are intended for carrying structural steel, steel billets and similar lading, and are fitted with fixed sides and drop ends. The general dimensions are: Length inside, 26 ft. 6 in.; inside width, 8 ft.; height of side, 1 ft. 3 in.; capacity, 15 long tons; light weight, 20,720 lbs.

In addition to these four types of high capacity cars, Mr. McIntosh has designed and built a number of 50-ton ore cars which are the highest capacity cars for regular service now in use in Great Britain. The body is of wood and the underframe is made up of rolled channels, strengthened with truss rods. There are three folding doors on each side for discharging the load. The cars are mounted on diamond arch-bar trucks and have the following general dimensions: Inside length, 34 ft. 7 in.; inside width, 7 ft. 7 in.; height of side, 4 ft.; length over buffers, 38 ft. 4 in.; wheel base, 29 ft. 3 in. The trucks have 39-in. wheels and concave journals of exceptional dimensions, being 12 in. long by 6 in. minimum diameter and 7½ in. maximum diameter. These cars are fitted with Westinghouse quick-acting brakes and also hand screw brakes. Their light weight is 40,320 lbs.

The Division Superintendent's Work.

The following conversational remarks are printed as they were made by a long-experienced and successful superintendent. He thinks that many of the old ways are the best ways, and few will fail to agree with him that one evil result of modern railroad organization is that the "bondage of desk work" nowadays does not leave the operating officer enough time to know and wisely discipline his men:

A great deal has been said, and most severe and just criticism made of delays in handling traffic, resulting in the blocking of yards and side tracks with freight which consignees need badly, notwithstanding the fact that millions of dollars have been spent to increase the efficiency of railroad service, in furnishing additional facilities, increasing the power and providing shops with more and modern machinery. And yet there is maintained a most complete Transportation Organization, for the general direction of the movement of traffic and distribution of equipment, and the working up of the most elaborate statements and statistics. Notwithstanding this apparently perfect organization, and the increased facilities that have been furnished, it would appear that comparatively more was accomplished in years past, when our facilities were limited, motive power light and generally in bad condition. This I attribute to the fact that formerly every one worked with the feeling that their superintendent was their General, that he was the only officer they need fear, and that on his success depended theirs.

With the introduction of specialists, or what might better be termed "expert observers in the various departments," there is a feeling existing among the subordinate officers, that no matter what they do, whether it appears as good railroad practice or not, they are liable to be criticized by one of the specialists, who occupy the rather enviable position of being able to claim what glory there may be for good results, while not being responsible for any poor showing that might be made.

In speaking of what was formerly accomplished with practically no facilities, a superintendent remarked, "Yes, I know that is true, and it looks impossible now, but you used to railroad—you were not called on for explanations such as are asked for now; you were in touch with every detail, and your men knew that they were working for your success."

The most natural question one would ask in view of this is: Have we gone beyond the safety line; are there too many specialists; are we drifting from the practical to the theoretical, and into letter writing, the most distasteful thing possible to the subordinate, whose time can well be devoted exclusively to doing the work? As a rule, the specialist is a theorist, strong in his convictions, has very little respect for the practical, and it is with difficulty that he is convinced that he may be wrong. Invariably the specialist is near the head. It is dangerous to oppose him, except in a diplomatic way, which takes time and taxes the mind and patience of the operating officer. It annoys and worries him, and thereby takes his mind from more important work. The transportation organization is a most valuable one, when the office is handled with skill, and in such a way as to avoid interference with the superintendents and their duties, helping them where possible, by suggesting improvements where it is apparent they can be made, and gaining their confidence, instead of criticizing and putting the operating official on the defensive.

As a rule, whenever there is a congestion which assumes alarming proportions, we attribute our troubles to lack of power and terminal facilities, with the result that heavy purchases of engines are made, and additional yard and side-track facilities furnished, which remedies the trouble in a measure. While it is a most excellent rule to provide facilities in advance of the business requirements, so as to be in a position at all times to take whatever business may be offered and handle it promptly, I think the question as to whether we are getting the results and reaping the benefit of expenditures, one worthy of careful consideration. It is well to determine whether or not it is possible that the new methods introduced, the keeping of elaborate statistics and the work done by the specialists, require so much of the time of the operating officers in making explanations, answering inquiries, etc., that their time and mind is occupied in other directions than those that would give the railroad the benefit of the additional facilities. There is no doubt that the attempt to run a railroad "from the office" will ultimately divorce officers and men, making yardmasters and subordinate officers become of the men, instead of the official staff, and result in sluggish movement.

To do this, only such records should be kept as will enable the superintendent, at a glance, to tell just what it is costing him to operate his division. This will relieve him of a great deal of clerical work, and enable him to get closer to his men and secure their confidence. This being had, the question of administering discipline with the least criticism, and to bring about the results desired, is one that is made easy.

That trade unions, especially the railroad organizations, have come to stay, there can be no doubt, and I firmly believe that they can be made beneficial to both their members and to the railroads.

It is my rule, in handling men, to make them feel that personally they are on an equal footing, and they recognize that I am their superior, only in an official sense. No matter how severe the discipline, or reprimand, when I am through with a case, the men understand that I never harbor ill feeling, and they do not fear any personal feeling that would interfere with their future. I am perfectly frank in telling them what I think, and if I do not believe their statements I tell them so, although it may be necessary, for want of proof, to decide in their favor.

In lecturing a man, I invariably put his family first. It is known that my sympathy is with the women and children, and I am sure I get more support from that source than any other. As an instance of this, we have a railroad town, which was incorporated as a local option town. The liquor men could not pass a law without the consent of the railroad to allow a vote to be taken. To this I agreed, provided the women were permitted to vote.

In the case of labor troubles, I have always been able to raise men to help out, not only my friends, but friends of my friends, have done what they could to help us pull through labor difficulties. The agreements with organizations I try not to discuss, taking the position that it is not necessary to discuss agreements when it is a question of justice, and that we can always be just without being forced.

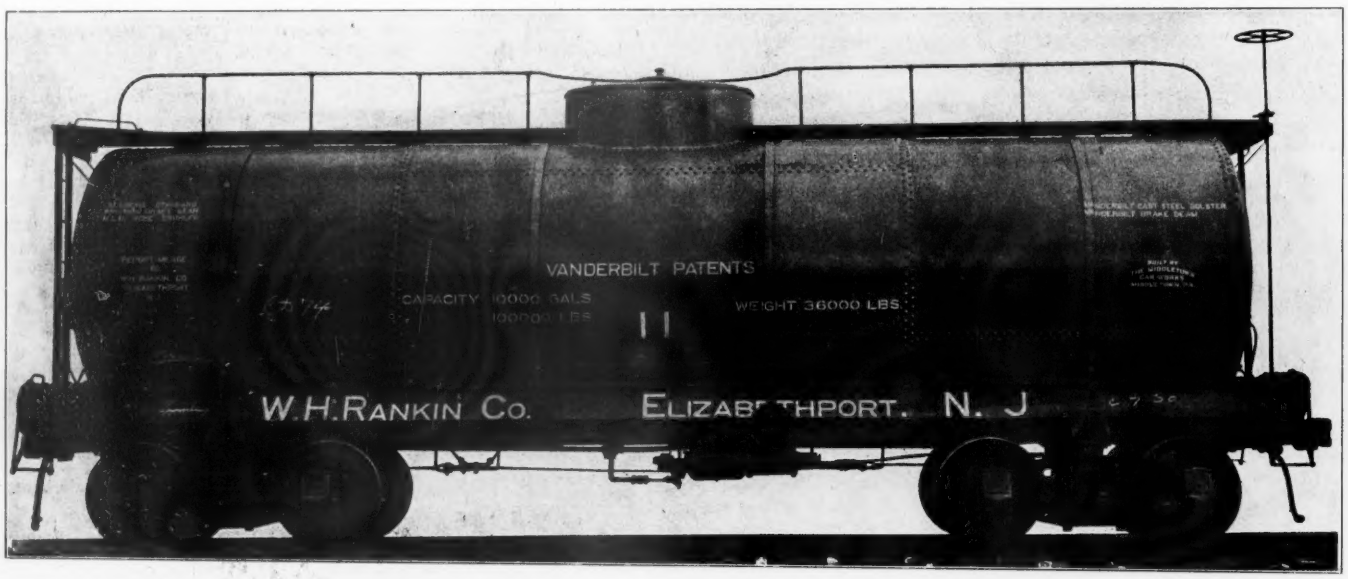
A trainmaster was appointed in the '80's. The division was completely demoralized. He was given absolute control of the train and yard service. He rode freight trains, was invited to the boarding houses of freight men, went with them and made himself one of them, except officially, and in two months a most remarkable change was made, and in a year the best men and most thoroughly satisfied set of men that ever a division was equipped with was the result. He was made a superintendent in about two years, and left the division after five years equipped with a first-class set of men, thoroughly well satisfied. In that time no interference was allowed; the men never gave any other officer a thought. The superintendent's success was entirely due to that fact.

The Baltimore Fire and the Railroads.

An inquiry as to the destruction of railroad property in the fire at Baltimore shows the following damage done: The Pennsylvania lost O'Donnell's wharf, a building about 200 x 75 ft., which was filled with goods; also the city ticket office. The Baltimore & Ohio lost the Center station, Spears station, Fell street station, and Chase's wharf, all freight stations in the Bay district and equipped with warehouses filled with bags and bales and hogsheads of sugar, tobacco, flour and other products. The Central building, owned by the Baltimore & Ohio, and used for its general offices, was also burned. The Western Maryland lost its city ticket office. This comparatively small list is apparently complete, the only heavy sufferer being the Baltimore & Ohio.

The fact that none of the railroad terminals except the wharves were contiguous to the burned district rendered unnecessary any extraordinary work on the part of the railroads in moving traffic, but the Baltimore & Ohio and the Pennsylvania placed their resources early at the service of the city and performed valuable work in moving fire equipment in record time. The Baltimore & Ohio brought four fire engines with their crews and equipment from Washington in 40 minutes, the regular running time of the fastest passenger trains between these points being 45 minutes; also, two engines from Philadelphia in a trifle over two hours and one engine from Wilmington. Although this was extraordinary freight and handled with great celerity, there were no accidents in connection with it, and General Manager Fitzgerald reports that the employees acted as if they were used to handling fire engines every day. The Baltimore & Ohio also brought 150 police from Philadelphia and the Pennsylvania brought the fire engines and crews from New York.

Some fast work was done at the Baltimore & Ohio's general offices in the Central building. Mr. Hale, General Superintendent of Transportation, and Mr. Coon, Chief Clerk to the Third Vice-President, were at the building early in the afternoon and notified the heads of the other departments that the books and records, including blue prints, the total valued at over a million dollars, should be moved. This work was promptly begun, and while it was in progress Mr. Hale formulated plans for the distribution of the effects and for the placing and occupancy of offices on Monday, if necessary. At half past three the conditions were telephoned to Third Vice-President Potter, at the head of the operating department, who at once came from his home in the country and directed the movement until the police ordered the occupants to leave the building, at 9 o'clock in the evening. When Mr. Potter arrived he endeavored to send a telegram to President Murray, who was in New York, but the wires snapped while the key was in the operator's hands. Word did not reach Mr. Murray until nearly midnight, but he was in Baltimore by 4 o'clock in the morning, having come special in three hours and a half. During the night it was decided to rent an unoccupied building in the vicinity of Camden station, and to do what squeezing might be necessary to crowd the general office employees into the buildings that had not been burned. By 7 o'clock these arrangements had been carried out, the necessary telegraph connections had been made, the furniture dealers had responded to the demands of the railroad



Vanderbilt Steel Underframe Tank Car—Capacity 10,000 Gallons or 100,000 lbs.

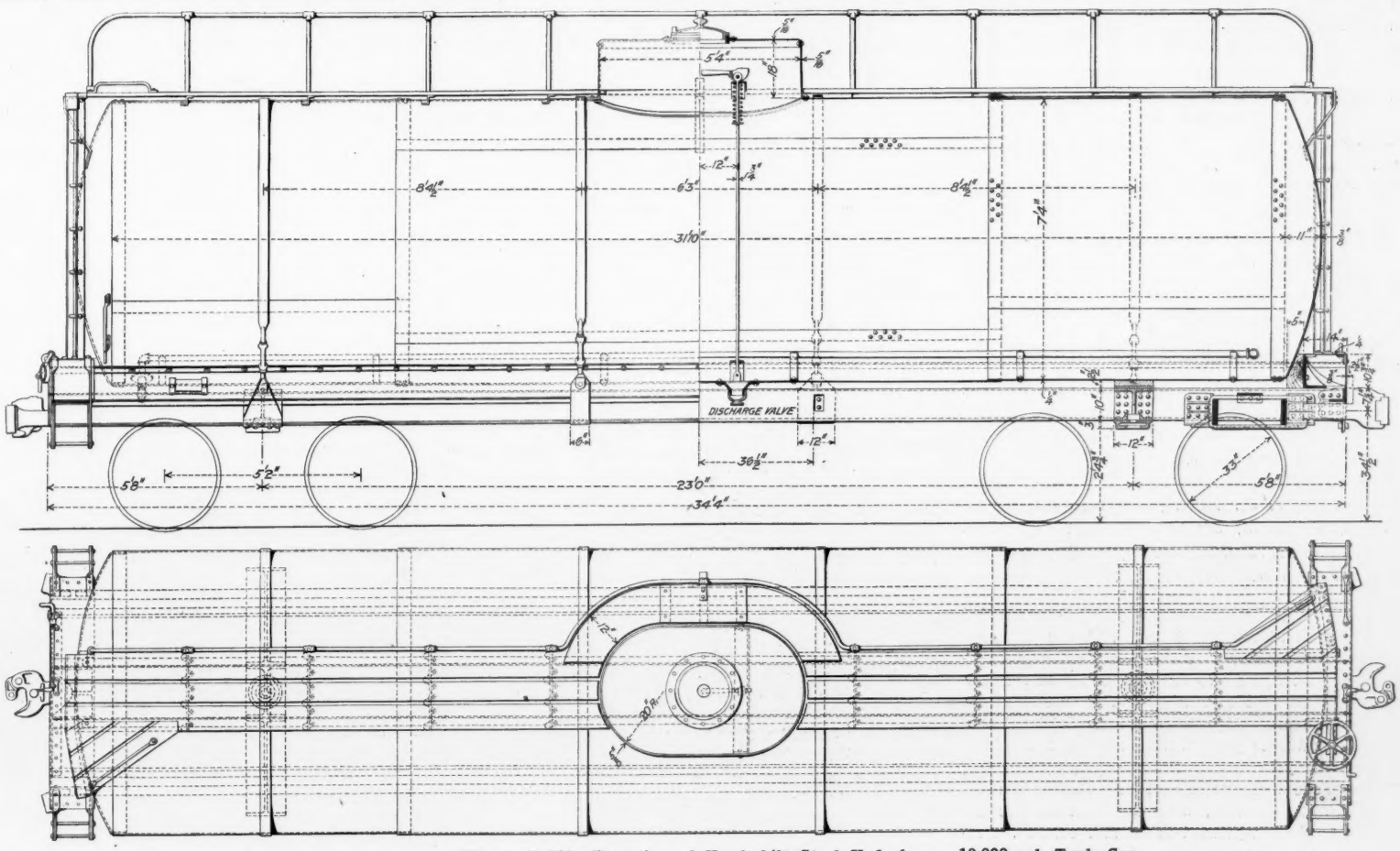
company, which was the first in the field to obtain new desks and other office furniture, and the business of the general office proceeded practically without any interruption. The officers and employees, with some exceptions, were on duty continuously for 36 hours.

An interesting feature of the Baltimore fire from an engineering standpoint was the effect of a devastating conflagration upon modern steel office structures. It may be said that this was the first fire at which thoroughly modern large structures have received this test. The Continental Trust Company building, 16 stories high, was, perhaps, the best of these structures, and although it was completely gutted of furniture and everything that the fire could feed on, the surveyors have pronounced the walls plumb and the iron floors and ceilings are unbroken. As it stands, the marble of the floors is baked to limestone, while the concrete lining has in general stood the terrific test. The safety vaults in the lower parts of the building, like the other safety vaults in the city, were entirely unharmed. But, as to the upper vaults, it may be mentioned, for example, that three vaults on the seventh floor were warped and their contents found on the floor in a charred mass, while the contents of another vault on the same floor, similarly built, remained uninjured. William Barclay Parsons, Chief Engineer of the Rapid Transit Commission, reports as an example of the heat to which some of these fireproof buildings were subjected, that the wooden sleepers incased in the concrete floor to which the transverse flooring was nailed, were consumed, notwithstanding the fact that they were protected on three sides from contact with the flames by concrete and were detached from one another. Walls in which the chief component part was brick stood the ordeal best, while granite walls suffered most. Terra cotta as a general thing stood well, the damage to the exteriors composed of that material being chiefly due to falling debris of nearby buildings. It would appear that the great damage to the interior of such structures as the Continental Trust Company building was caused in great part by the fact that the windows were unprotected, and it is believed that if a law had been in force requiring the use of iron shutters that much of the contents of such buildings could have been saved. As it was, there was nothing to prevent the flames from surging through and transforming the interior into a steel and concrete lined furnace.

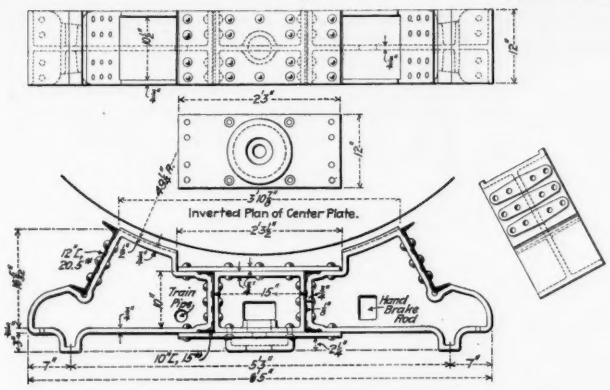
Press reports of February 17, state that the Baltimore & Ohio Railroad Company has selected a site for a new central building for its general offices. The building will be nearer Camden Station, and will occupy an entire block. Plans are now being prepared.

Vanderbilt Steel Frame Tank Car.

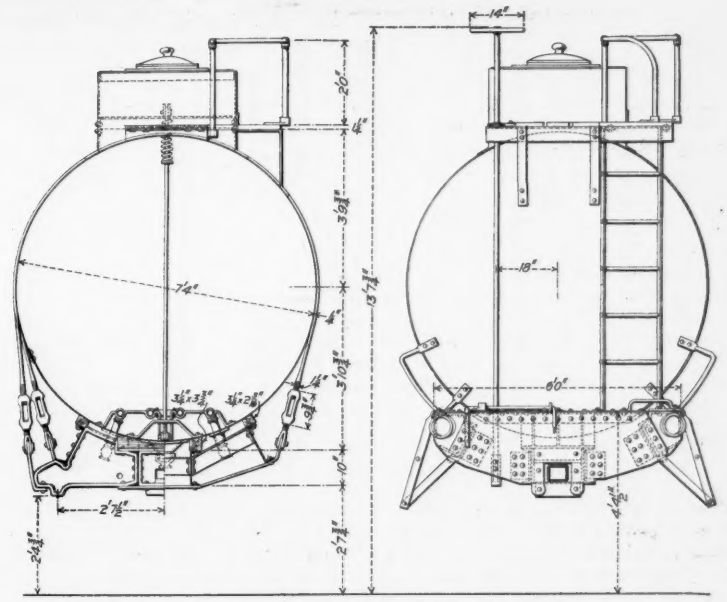
The W. H. Rankin Co., Elizabeth, N. J., has recently received from the Middletown Car Works, two 10,000-gallon, steel underframe tank cars built from the patented designs of Cornelius Vanderbilt. They are mounted on 100,000-lb. trucks and are marked with that weight capacity. The tank is made of ¼-in. plates and is 7 ft. 4 in. internal diameter and 32 ft. 10 in. long between centers of the heads. It is built up of only three rings, each ring having only one longitudinal seam. All the seams are double lap riveted. The dome is of $^{5}/_{16}$-in. plate, is 18 in. high, 5 ft. 4 in. long and 3 ft. 4 in. wide, with a circular manhole opening 15 in. in diameter. The discharge valve in the bottom of the tank is operated by a handle in the dome, which pulls up and raises the valve off its seat through a reach rod extending down through the tank. The handle, spring and rod are supported by a light angle riveted across the inside of the dome.



Plan and Side Elevation of Vanderbilt Steel Underframe, 10,000-gal. Tank Car.



Detail of Cast Steel Body Bolster.



Cross-Section and End Elevation of Vanderbilt Tank Car.

The underframe consists of two 10-in., 15-lb. channel center sills spaced 15 in. apart and two 12-in., 20.5-lb. channel side sills, spaced 3 ft. 10⅞ in. apart, tilted at the proper angle to bring the webs normal to the circumference of the tank at the point of contact. Hard-wood slabbing, $2\,^{5}/_{16}$ in. thick, is inserted between the top flange of the side sill channels and the tank, and slightly thicker pieces on the top flanges of the center sills and over the bolster. The bolster is a special steel casting made in three parts and shaped to fit in around all four longitudinal sills. The three pieces are tied together with a top plate, ¾ in. x 12 in. x 27 in., and by the body center plate, which is a separate casting. An I-beam section is preserved in all the bolster castings with webs and flanges ¾ in. thick. The side bearings are cast on the two outside pieces.

A ⅜-in. plate cut approximately to the shape of a segment of a circle forms the end sill and it is attached to the longitudinal sills with heavy angles. Bearing against the back side of this plate and in between the center sills is riveted a heavy casting which serves as a striking block for the coupler horn. The carry iron is an angle bolted to two lugs projecting from the bottom of this casting. The tank head-block is a piece of hard wood 5 in. x 10¾ in. x 21 in., cut out to fit the curve of the tank head. It rests directly on the center sills and is backed up with a ribbed casting which is riveted to the top flange of the center sills and comes out against the end sill plate.

The tank is held down on the frame with four tank bands, 3 in. x ½ in.; one over each bolster and two near the center, on each side of the dome. Those at the bolsters are attached by turnbuckles to 12-in. x ⅝-in. straps riveted to the side castings of the bolster with four ¾-in. rivets. In the center, the straps pass under all four sills, being riveted to each, and fasten to the tank bands with turn buckles on each side. The sills are braced apart at these points by angle spreaders.

These cars are mounted on arch-bar trucks with Vanderbilt cast-steel bolsters, and are equipped with Sessions-Standard Type C friction draft gear. In the bottom of the tank are four steam pipes arranged with the necessary connections outside the tank at each end, to attach to a steam line at unloading points to accelerate the discharge of thick oils in cold weather.

We are indebted to Cornelius Vanderbilt for the drawings and photographs.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

It is a fact of unusual interest, in the study of railroad organization, that Mr. Loree's first important work after coming to the presidency of the Baltimore & Ohio was to change the character of its organization from a departmental to a divisional one, and that his first important work as President of the Rock Island system is to reverse this, by devising as out-and-out a departmental organization as we have seen. A diagram, with comment on the details of the plan, is printed in another column. Presumably no further reason need be sought for the change than the one given, that the tremendous growth of modern traffic has so changed operating conditions that it is hard, indeed, to find a division superintendent who can solve operating and maintenance difficulties with equal brilliancy. Yet we are reminded of an address which Mr. Arthur Hale delivered before New York University in 1902, in which he wisely observed that whenever a department escapes from the hands of the superintendent, it is only too apt to forget that the real object of a railroad is to provide transportation; that the engineer will build yards to hold cars instead of to move them, and the master mechanic will think more of his performance sheet than of the amount of tonnage moved. But Mr. Loree, having organized both kinds of control, certainly qualifies as a first-rate expert in his preference for specialized knowledge at headquarters, as against direct control in the hands of the superintendent.

The experience of the Caledonian Railway with the high capacity steel cars recently introduced on that road is said to have been satisfactory, and this in a country where their use is commonly believed to involve such radical and expensive changes in methods and in fixed plant as to make them not economical. Mr. J. F. McIntosh, locomotive superintendent of the company, who is one of the progressive men in British railroad mechanical work, says that the day of the 6-ton or 7-ton car is past, but that while a concerted effort is being made by all the British railroads to load cars to their full capacity the keenness of present-day competition in Great Britain and the imperative demand for quick delivery of goods at destination entirely destroys the possibility of adopting cars of very large capacity for ordinary merchandise traffic. Shippers in England have, so far, resisted the efforts of the railroads to increase car-load consignments, and by their action have made the use of cars of more than 15 tons or 20 tons capacity impracticable for any service but mineral traffic. From the railroads' side Mr. McIntosh considers the high capacity car "in every respect the best for all classes of traffic," the principal advantage being the low tare weight in proportion to the paying load; the reduction in the number and cost of car and engine movements made in sorting and placing the cars at terminals which is a large proportion of the cost of operation of such a road as the Caledonian and other English short-haul roads; the less track space required by the large cars in yards and freight houses; and the reduced cost of maintainence and repairs of the heavier rolling stock. Further, he says it is to the general adoption of the high capacity car that British railroads must look for one of the chief factors in reducing the cost of transportation. By less radical undertakings in this direction Mr. George S. Gibb, general manager of the Northeastern railway, has already succeeded in reducing his train mileage by over 12 per cent., and this with an increased tonnage.

The differences in the costs of handling locomotives at terminals, for different roads or even for different divisions of the same road, which are disclosed by the figures given in another column, do not necessarily represent differences in efficiency of operation of this branch of the service. Comparisons of the unit costs given may be misleading, for, to make these justly, all the governing conditions of each system of accounting, nature of the facilities, size of power handled, cost of materials, price and kind of labor, extent and nature of repairs, kind of fuel, etc., must be known. The location of the terminal is also an important factor. For example, if the shops and roundhouses are some distance from the terminal yards, the locomotives may be taken to the roundhouse and returned to the yards by hostlers or helpers, thus increasing the cost of "hostlering." In regions where the water is bad, boiler washing may be required every round trip. At some points no attempt is made to care for engines, beyond cleaning. Other places have fully organized running and emergency repair shops, like the Rensselaer roundhouse of the New York Central. Furthermore, the cost of handling locomotives increases in proportion to their size, and a roundhouse at the end of a mountain division would show up unfavorably if the costs were based on the number of engines handled. The Lake Shore has difficulty in defining what shall constitute an "engine handled." Nevertheless, it is admitted that in most cases economies can be effected in roundhouse expenses. But to do this, it is first necessary to reduce expenses to an equitable basis. It has already been suggested by a committee of the Master Mechanics association that a ton mile basis be used in determining the cost of repairs, and this scheme, if applied to the cost of handling locomotives at terminals, would, no doubt, greatly assist in making accurate comparisons.

A New England Railroad Historical Note.

The absorption of the Poughkeepsie Bridge System by the New York, New Haven & Hartford suggests some historical reflections. It was to this system that the late President C. P. Clark once applied the expressive term, "Nuisance value," and this estimated damage, together with the specific value of the Poughkeepsie bridge, he was willing to pay for the small but sharp competitor. President Clark, owing to opposition of his directors, failed, and now President Mellen takes the system, presumptively at a much higher price, as a resultant of the two values combined. The history of the Housatonic road in its relation to the New Haven, here exactly repeats itself. There is another historical reflection as to the inexplicable absurdity of the "Montague Farm" conflict of a few years ago with its sequels of bad blood and vast and absolutely futile costs to both the contesting parties. The New Haven corporation now owns or controls 2,224 miles of single steam track out of the total of 2,299 in the States of Rhode Island and Connecticut, and of the 75 miles not yet absorbed about 20 miles are represented by five branch lines of the most trifling character. Probably nowhere in the world—apart from State ownership of railroads—will there be found in such a region of population and industrial wealth so remarkable a case of territorial control.

The changeful history of the Central New England is closely bound to the dramatic career of the Poughkeepsie Bridge, for the two projects were part of the same bold and brilliant scheme to connect the Pennsylvania coal regions direct with the coal consuming territory in New England. The Poughkeepsie Bridge Company was chartered in 1871 with this in view, and work on the bridge was begun soon after, but was stopped in 1873 and was temporarily resumed about 1878. The company received a new lease of life by reorganizing in August, 1886, and a contract was then let to the Manhattan Bridge Building Company to erect the bridge, the steel and pier work subsequently being sublet to the Union Bridge Company of New York City. The bridge was to be completed early in 1888. In 1887 the Poughkeepsie Bridge Company organized connecting lines to reach the desired coal territory, and the syndicate was composed first of all of the bridge company, then of the Hudson connecting railroad, which was to build a line approximately 30 miles long, from the bridge to Campbell Hall, where connections were made with the Erie, New York, Ontario & Western, and Walkill Valley railroads. On the other side of the river was the Poughkeepsie & Connecticut Railroad, running to a connection with the Hartford & Connecticut Western, which was acquired by stock control in 1888. Other connections in the Pennsylvania coal regions were bought in 1888 and 1889, and the several lines were linked together in the face of some opposition by competitors under control of the Poughkeepsie Bridge Company, so reversing the usual order of affairs that the bridge controlled the railroad interests instead of the railroad interests controlling the bridge.

History formed rapidly about the bridge project. The next chapter of development was furnished by the Philadelphia & Reading. McLeod, daring, brilliant and unrestrained, was President. He had control of the Central New Jersey and Lehigh Valley and sought new worlds to conquer. Why should the Reading not be connected direct with Boston, thus forming a new east and west trunk line south of the Boston & Albany, which alone reached any of the territory involved? In 1892 the Reading bought the entire capital stock of the Delaware & New England Railroad, which then owned all the capital stock of the Poughkeepsie Bridge Company and a majority of the Central New England & Western, which was at that time the corporate name of the bridge syndicate lines. In February, 1892, the Reading began to operate the bridge system, but quickly got into difficulties. McLeod had undertaken more than he could carry out, and after succeeding Austin Corbin as President in 1890 he singularly enough succeeded himself by being appointed receiver of his own defaulting road in 1893. It is unnecessary here to go into the particulars of his vast scheme, involving consolidation in one control and interest of the Central New Jersey, Lehigh Valley, Poughkeepsie Bridge, New York & New England and Boston & Maine. In October, 1892, he was elected President of the Boston & Maine. In March, 1893, the same month that he was made receiver of the Reading, he was elected President of the New York & New England. But his tide of fortune had turned, and he shortly after resigned as receiver of the Reading, on the ground that financial assistance would not be given while he remained at the head of the road, and following this he resigned as President of the Boston & Maine. As was said in the *Railroad Gazette* at the time of Mr. McLeod's death in 1902, he was a good example of a man of great gifts whose usefulness and success in the world were impaired by a defective moral vision, and his life, like his ambitious plans, failed in a large sense.

When the Poughkeepsie Bridge and the Central New England & Western emerged from this entanglement they were reorganized under the name of the Philadelphia, Reading & New England; foreclosed again, and named Central New England. The bridge has remained from the time of its building to the present as an example of an engineering feat more interesting than useful. It was considered a marvelous work when it was built, with its total length of 6,627 ft., two shore spans (the shore arms of the cantilevers), and five river spans, with base of rail 212 ft. above high water and head room of from 130 to 163 ft. Built at a time of relatively small cars and light locomotives, it is ill adapted to the task of hauling a low-class bulky commodity in train loads of the size that economy demands. It will be interesting to see what part the new western connection will play in the traffic scheme of the New Haven road. It seems probable that its moral benefits will be greater than the physical ones—that its "nuisance value" is still comparable with its income value.

Electrifying Steam Railroads.

"The officer responsible for the security of the investment in his steam railroad is taking considerable risk if he does not keep a sharp eye on the sure and steady advance in the knowledge of the use of electricity." This was written more than a year ago, and surely the "steady advance" is accelerating at a rate that needs attention. For heavy railroad work the electric art has not advanced sufficiently to warrant the electrification of any railroad trunk line, and the first of the experimental branch lines so treated happens not to have proved successful. Nevertheless, a fact developed during the past year that, in a given case on a large scale, passengers can be hauled for 30 per cent. less by electric power (fixed charges disregarded) is undeniable, and in the end its results are unquestionable. But the cost of the change is in most cases simply appalling to those called on to furnish the money, and it is safe to say that such changes will be made only when for one reason or another they are compulsory.

For long distance heavy freight trains the time for using electric motors is farthest off, and without further and unexpected developments the time for changing the power on existing freight tracks may never come. For suburban passenger trains and spur lines it is imminent; for longer distance passenger trains it is not at all improbable. All of these predictions of slowness to change are based on existing conditions and the enormous loss due to setting aside the present locomotives and the plant for their care. If we could imagine the present inhabited country with no railroad equipment and a chance to put in service immediately the most profitable motive power, it is safe to say that not many steam locomotives would be set at work.

Those who have followed this subject closely will remember the report of Mr. Bion J. Arnold to the New York Central last year on the proposed electrification of the New York terminal. His study showed that "while there would be a slight annual saving in operating expenses in favor of electricity, it is not sufficient to warrant its adoption on the ground of economy in operation alone, although its adoption can be justified on other grounds." The topographical characteristics of the land near the New York Central's terminal make it necessary for all trains entering and leaving the station to pass through a tunnel. The smoke and gases from the locomotives not only annoys passengers and residents, but also destroys the track and constitutes an element of danger. For these reasons, alone, electrification was forced on the Central. The study of the Pennsylvania leading to the adoption of electricity in the tunnel under Manhattan island and its rivers is not at hand, but it may also be safely assumed that convenience, comfort and safety, and not economy of operation were the controlling elements. It well may be that ultimately the New York Central will profit by its investment in plant and in copper and electrical apparatus, for the road passes through a picturesque and attractive territory north of New York City, which has unusual possibilities as a suburban residence district and to which electric lines will bring enormous increases. The company is wise in proposing to extend its electrification scheme into this territory, but the project would have been considered too radical pioneering if the millions of dollars were to be spent for the sole purpose of getting a possible, but not certainly sufficient, additional traffic.

The report of Mr. Arnold showed that, neglecting fixed charges, the use of electricity would save about 25 per cent. per locomotive mile over present cost of operation. But when interest and depreciation in both cases were considered the saving almost disappeared. These figures referred to a direct current system, which was considered to be the only system sufficiently tried or developed to warrant its use. To be more exact, Mr. Arnold's figures for the cost per locomotive mile of operating the division, were as follows:

	Steam.	Electricity.
Operating expenses	23.05	15.80
Fixed charges	1.13	7.83
Total	24.18	23.63

This shows clearly to the engineer that the point of attack is the excessive 7.83 cents cost per locomotive mile due to excessive cost of electric installation. The capital invested in boilers, engines, generators, transmission lines, motors, etc., can be greatly reduced by the use of alternating current, but engineers have been unable, so far, to make practical a motor which will operate with a single phase alternating current and fulfil the rigid requirements of railroad work. Many attempts have been made to perfect this type of motor and several of the larger electrical companies claim to have solved the problem, but experience has not yet demonstrated the correctness of these claims. Three phase systems have been built, notably the Berlin-Zossen experimental line, but after all, these systems are but a step from direct current to single phase. It has been the history of many of the world-advances in applied science, that having once demonstrated and proved first principles, the means of utilizing them was soon forthcoming. With the brightest specialists of the world working for the perfection of the single phase motor, it is expected to become a reality. Not until then will the steam road manager need to consider the advisability of discarding the steam locomotive for through freight and passenger traffic. Even then, there is a nice problem to be solved and all conclusions will have to be reduced to a dollars and cents basis. To induce voluntary transformations, electrification must show a saving in cost of operation equal to the interest on the new property and on the loss in disposing of the old property. When congested terminals, such as the Pennsylvania and the Central in New York City, and short branch lines are electrified, extensions of the system may be based on ascertained advantages.

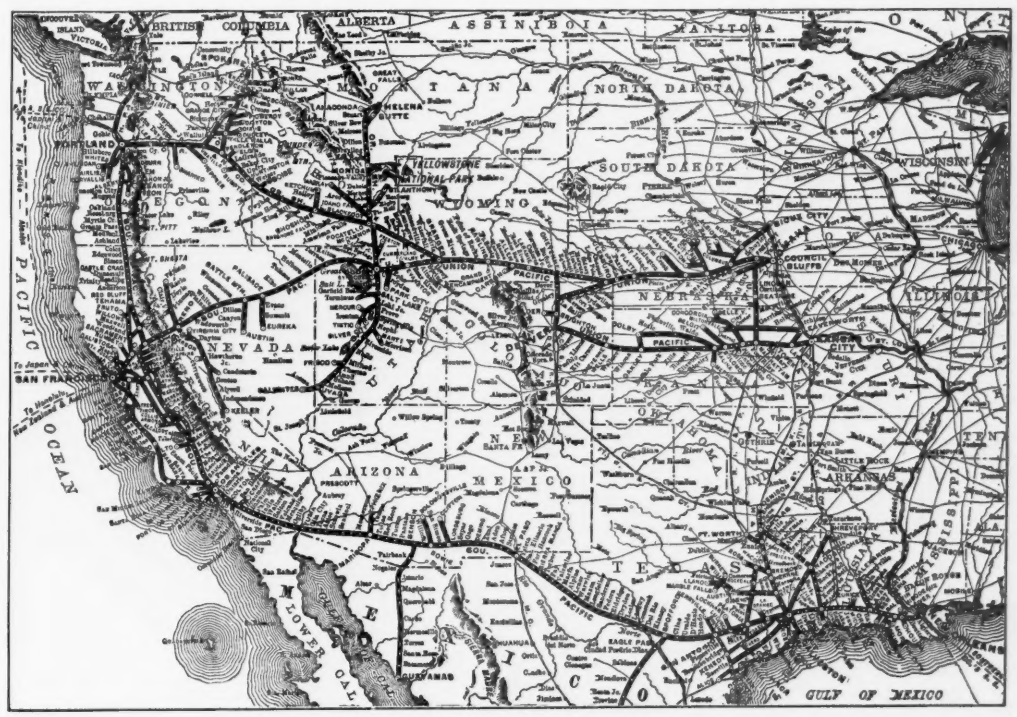
Southern Pacific.

With an average mileage of all rail lines operated of 8,842 miles, including both proprietary and non-proprietary, as against 8,757 miles last year, gross transportation receipts, which include water lines as well as rail lines, were $88,320,335, an increase of $4,776,514. Including interest, dividends, miscellaneous receipts and rentals, the gross earnings aggregated $90,683,437, as against $85,742,346 last year. The increase in operating expenses, however, was greater than the increase in earnings, and the balance of receipts over disbursements, $8,964,431, shows a decrease of $1,577,040. This, however, is exclusive of proceeds from sale of land amounting to over 1½ millions, paid over to the trustees of the respective mortgages to be used by them for the redemption of bonds. The entire net income for the year was applied toward the payment of expenditures for reconstruction, betterments and additional equipment, although equal to approximately 4½ per cent. on the $197,849,258 of Southern Pacific Company's outstanding stock. The amount of surplus earnings which have in this way been turned back into the property since the commencement of operations in 1885 aggregates over one hundred millions ($100,081,022), as representing the total expenditure for which no securities have been issued. The following table indicates the way in which this sum has been divided between expenditures for extensions and betterments and for securities and other property acquired.

Cost of securities and other property acquired by the Southern Pacific Company, in excess of securities issued	$9,194,353
Cost of securities and other property acquired by the proprietary companies, in excess of securities issued	44,978,868
Total	$54,173,221
Expenditures for extensions, betterments, additions and for other property paid from the income of the respective proprietary companies and from the income of the Southern Pacific Company	19,163,074
Total cost of railroads and properties in excess of stocks, bonds and other obligations outstanding against them	$73,336,295
Amount of free assets of Southern Pacific Company not included in capital accounts	26,744,727
Total amount expended for which securities have not been issued	$100,081,022

An interesting feature of Southern Pacific reports for the last few years has been the rapid development of passenger traffic. This year earnings from passengers and mail and express aggregated $26,976,514, or over 32 per cent. of the total earnings from the rail lines, an increase of over 2¼ millions from 1902, when the percentage was 31 per cent. In fact, the actual increase from passenger traffic was about ¾ of a million greater than the increase from freight traffic. The broad character of the freight traffic on the Southern Pacific lines and its relatively equal division between many kinds of commodities has received comment in previous reviews of the company's reports. Agricultural products furnished the largest percentage, equal to 26.28 per cent. of the total. Products of mines, with 23.25 per cent., are next in order. Forest products aggregated 17.44 per cent., and the total of all manufactures, which thus appear as of relatively slight importance as yet, was 15.55 per cent. Comparing these figures with the returns for the year 1900, it is interesting to see the large increase in products of mines. The total tonnage going to make up the 23½ per cent. in 1903 was 3,991,089, of which unclassified products of mines aggregated 2,251,404 tons, and coal amounted to only 423,492 tons, while in 1900, coal, with 593,389 tons, was the largest item in the total tonnage of 1,512,736 under this classification. Mine products at that time aggregated less than 10 per cent. of the total freight tonnage. During the three years elapsed the tonnage of agricultural products increased by over 1,000,000 tons. The products of mines increased almost 2½ million tons, while manufactures scarcely increased at all.

The disproportionate increase in operating expenses, which was to have been expected in common with the results on all of the trunk lines during the past year, is attributed in considerable part to the general increase in wages which went into effect last fall, to large payments for extra time occasioned by traffic congestion, and to other features in connection with the additional expense attending the movement of traffic during the year in which a large amount of reconstruction work was done.



Southern Pacific and Union Pacific Lines.

Since the last report, the Southern Pacific Company has purchased the steamships and other property of the Cromwell Steamship Company, formerly operated independently between New York and New Orleans, and is now utilizing these steamers to provide for the first time a water passenger route between New York and the Eastern rail terminal at New Orleans. The large fleet of fine steamers previously owned by the company and running on this route under the name of the Morgan Line, carried freight only. Other changes were made in the steamer lines operated on the Atlantic Coast and on the Gulf by diverting a portion of the Morgan service from New Orleans to Galveston and by discontinuing the line previously operated by the Morgan's Louisiana & Texas Railroad & Steamship Company between Morgan City and Brazos de Santiago.

Charges for maintenance of way and maintenance of equipment also increased considerably during the year. The maintenance of way expenditure averaged $1,457 per mile of main and second track, against $1,362 last year, a very large sum in consideration of the extensive single track mileage in new country. Equipment maintenance increased $1,677,485, or 18.38 per cent. A part of the increase was due to an increase of 4,314,030 miles run by locomotives, and the remainder is chiefly chargeable to the greater cost of repairs on the heavy locomotives now used. Almost $200,000, however, is charged against the cost

of replacing 34 locomotives sold or scrapped, and $138,655 for changing coal-burning locomotives to oil burners.

The strong financial position of the company, as indicated by the turning of the surplus account into assets through a series of years, again shows itself in the loan to meet the expenditures on account of the proprietary companies for new construction, betterment and additions and for the acquisition of other property. Pending the adoption of plans for financing these requirements $22,845,743 was borrowed, but against this liability the Southern Pacific Company has free assets aggregating $29,578,727. The total capital expenditures during the year by the Southern Pacific and proprietary companies amounted to $28,821,041, of which the net amount chargeable to the subsidiary companies was $16,027,538. Purchase of the Cromwell property and advances to the Pacific Mail Steamship Co. for the steamers "Korea" and "Siberia," and rolling stock purchases aggregated $7,159,030 of the $12,793,503 chargeable to the Southern Pacific and nearly four millions were advanced on account of the Ogden-Lucin cut-off and other new lines not included in the expenditures for subsidiary lines.

With the exception of the loan, referred to above, which comes under current liabilities, the only important net charge on the liability side of the balance sheet is the increase of $5,000,000 in gold 4½s due Jan. 1, 1905. No new capital stock was issued during the year. Total capital assets increased from $292,264,526 to $320,610,347, and total liabilities from $282,088,217 to $311,337,799, leaving a profit and loss balance of $9,272,548, as against $10,176,309 last year.

The following table compares the chief statistics of operation in 1903 and 1902:

	1903.	1902.
Average mileage all rail lines	8,842	8,757
Gross receipts, rail and water	$88,320,335	$83,543,821
Total receipts, inc., int. and rentals.	90,683,437	85,742,326
Passengers, mail and express (rail).	26,976,514	24,722,299
Water lines, earnings	5,395,048	4,620,098
Main. way and structures	13,074,326	12,093,242
Maintenance of equipment	10,805,737	9,128,252
Cond. transportation	30,086,498	28,079,870
General expenses	1,831,458	1,699,781
Water line, expenses	4,503,241	3,893,554
Total expenses	60,301,260	54,894,700
Total disbursements	81,719,005	75,200,855
Bal., receipts over operating exp'ses.	28,019,075	28,649,122
Bal., receipts over disbursements	8,964,431	10,541,471

NEW PUBLICATIONS.

Points for Buyers and Users of Tool Steel. By George W. Alling. New York: David Williams Co., 1904. Cloth, 224 pages. Price $2.

The consumer of tool steel who reads this book carefully will be able to decide if his workmen or the steel maker is responsible for failures of tools. In a brief and simple way it explains the different methods of steel making and the care required in the process of manufacture to produce a grade of steel free from defects, together with a review of these defects, how they are caused and how the consumer may detect them. It is pointed out where cheap steels can be used with economy and where expensive and high grade steels are absolutely essential. The book is written in the interest of no particular steel nor to endorse any special process of treatment, but to assist the buyer in deciding what grade of steel is best suited to a particular use and to discriminate amongst the large variety of steels offered. The latter part of the book has been written especially for the mechanics and smiths who use and treat tool steels. It deals with many of the difficulties encountered in shaping, hardening and grinding tools. The treatment of the whole subject is general rather than specific and the suggestions given are not intended as rigid rules to be followed in all cases, but more as guides to the application of common sense and practical experience in determining the right steel to use or the proper treatment in individual cases. It is a book which is well worth a careful study by consumers of tool steel and by the men who use it in the shop.

Railways. By E. R. McDermott, Joint Editor of the *Railway News* and City Editor of the *Daily News*. Methuen & Co., 36 Essex street, London, 1904. 5 x 7, 197 pages. Price 2s. 6d.

Mr. McDermott represents the conservative side of the recent agitation in England for the use of American methods of railroad operation and accounting. His paper, the *Railway News*, in reply to the series of articles in *The Statist*, entitled the "Railway Position," printed another series entitled the "Real Railway Position," in which the points at issue were hotly contested. It is interesting and instructive to read of British railroads as viewed strictly through British eyes, and a number of the points of view impress the reader as being exceedingly reasonable, in the face of the recent agitation. Mr. McDermott believes, for example, that the British system of railroad directors representing all the great centers from which the companies draw traffic, rather than a few overwhelming stock interests, is the correct one, and we are on the whole inclined to agree with his belief that "from a national point of view the British system is superior to the American 'one man' control, while it is equally obvious that movement in the case of a board of, say, 20 individual directors must be vastly more tardy than in the case of a decision to be taken by one individual." In regard to the question of full ton-mile statistics, the author thinks that information of this sort is generally not only accumulated at considerable expense but is superfluous, as the general manager finds such statistics unimportant compared to the detailed information with which he is constantly in touch, while the system of averages on which ton-mile figures must necessarily be compiled renders them misleading. It will be recalled that the other side in this controversy maintains that ton-mile figures afford the best and most feasible way of keeping track of and checking off the progress of railroad working. The discussion as to increased size of equipment is conservative and logical, and the limitations presented by the permanent clearances are offered as an objection too great ever to be surmounted except in isolated cases. The author believes that the interest on the cost of transforming British lines sufficiently to permit them to use rolling stock of American proportions would never be paid by the increased business or economies which would result, especially in view of the "retail" character of British freight traffic. A long description is given of the clearing house through which traffic balances are adjusted between different companies and cars are accounted. There is also an interesting critique of the history and practice of "stock splitting," or dividing up old ordinary stock into two or more classes corresponding in general to our preferred and common stock. The author is not inclined to believe that British railroad companies as a whole have increased their capital obligations unduly in the last decade, but is less convincing on this point than in his previous line of argument. Increased taxation as a source of increased expenditure receives proper consideration. As a whole, Mr. McDermott's book gives a good insight into the administrative and financial side of British railroads.

TRADE CATALOGUES.

Buffalo Forge Co., Buffalo, N. Y., issues a 24-page illustrated booklet showing the various types of engines which it makes. These include horizontal, side and center crank engines, either simple or tandem compound and with open frame or built enclosed for self-oiling; also vertical, simple or steeple compound engines, open or enclosed and vertical marine type engines, simple and compound. Another similar booklet of the same company shows different types of heating and ventilating apparatus for either the "blowing through" or "drawing through" systems.

J. H. Williams & Co., Brooklyn, N. Y., makers of all kinds of drop-forgings in iron, steel, copper, bronze and aluminum, give sizes and prices of standard automobile and general forgings and drop-forged wrenches in the 12th edition of their catalogue dated Jan. 1, 1904. Vulcan chain pipe wrenches are also quoted. About 700 assorted sizes of 29 patterns of bolt wrenches with a range of openings for every size of bolt from ¼ in. to 5 in., inclusive, are listed.

B. F. Sturtevant Co., Boston, Mass., describes in its condensed catalogue No. 115, second edition, a number of new machines among which are a new type of handblower, new types and sizes of forges, vertical engines, semi-enclosed bi-polar and 4-pole motors, factory equipments, industrial railroad equipments, etc. It also contains a description of the Sturtevant heating, ventilating and mechanical draft systems and apparatus.

Crocker-Wheeler Co., Ampere, N. J., describes crane motors and controlling apparatus for traveling and stationary cranes and hoists in Bulletin No. 40, issued last month. The motors are of the enclosed type and are built in sizes from 1½ h. p. to 60 h. p., to run at speeds of 1,020 r. p. m. to 350 r. p. m., and operating on circuits of 110, 220 or 500 volts.

C. & C. Electric Co., New York, gives a list of recent installations of its type "M P" generators and motors in Bulletin No. 147 and a brief description of these machines in another bulletin, No. 149, dated Dec. 29, 1903.

Comparative Tests of Locomotives Using Saturated and Superheated Steam.*

The advantages of superheated steam in stationary engines have led the management of the Prussian State Railways to arrange for tests of locomotives using moderately superheated steam. Two express engines on the Breslau division were fitted with Pielock superheaters, as shown in Figures 1 and 2, and tests were made in comparison with two other locomotives of the same classes but without superheaters.

The superheater consists of a cubical box, placed in the center of the boiler, directly under the dome, and forming a water-tight compartment about the flues. The front tube holes are larger than the rear, so that defective tubes can be withdrawn in the usual manner. The boiler steam is taken in at the top of the box and after being led in a winding path about the boiler flues is delivered with the desired degree of superheat to the throttle valve in the dome.

The modified design which is to be introduced shortly is shown in Fig. 3. The walls of the steam passages go between the flues and are therefore more easily constructed than those shown in Fig. 2, through which the flues pass.

This superheater can be applied to any ordinary locomotive without change of boiler or machinery. It is therefore particularly suitable for comparative tests. The dimensions of the locomotives and the results of the tests are given in the following table:

Comparative Tests of Single Expansion and Compound Locomotives With and Without Superheaters.

No.	Dimensions and results.	Single expansion locomotives. Without superheater.	Single expansion locomotives. With superheater.	Compound locomotives. Without superheater.	Compound locomotives. With superheater.
1	Cylinder diameter high pressure, in.	17		18	
2	Cylinder diameter low pressure, in.	..		26¾	
3	Stroke, in.	23⅝		23⅝	
4	Driving wheel diameter, in.	78		78	
5	Heating surf. of boiler, sq. ft.	1,348	1,122	1,270	1,044
6	Htg. surf. of superheater, sq. ft.	..	226	..	226
7	Grate area, sq. ft.	24.43		24.75	
8	Average train weight with eng. & tender, tons (2,000 lbs.)	267		346	
9	Train miles during test, miles.	1,190		2,360	
10	Boiler pressure (gage), lbs. per sq. in.	170		170	
11	Temp. of superheated steam in dome, deg. F.	..	500	..	446
12	Temp. of feedwater, deg. F.	50	50	50	50
13	Average steam consumption per hour, lbs.	9,570	8,070	11,620	10,460
14	Average coal consumption per hour, lbs.	1,195	1,040	1,574	1,520
15	Saving in water, per cent.	..	16	..	10
16	Saving in coal, per cent.	..	12.3	..	3.5
17	Lbs. of water per lb. of coal.	8.00	7.70	7.70	6.88

In order to obtain reliable results which could be used for purposes of comparison it was only necessary to determine by observation:—(1.) The work done by the locomotive. (2.) The water evaporated per hour. (3.) The boiler pressure. (4.) The temperature of the feed water. (5.) The temperature of the superheated steam. From these figures the heat consumption of the locomotives can be calculated and compared, without the necessity of measuring the coal consumption. This was only measured so as to compare the actual saving of coal with that calculated so as to obtain an idea as to the efficiency of the boiler.

A large discrepancy between actual and calculated results indicated that the observed figures were unreliable and not suitable for comparison. Small differences are accounted for by inaccuracies in the measurements of the coal, which are unavoidable with a locomotive. On the other hand the water consumption can be exactly measured. Given accurate figures for the temperatures and water consumption, the calculated saving in coal is necessarily more reliable than that measured, which is too greatly influenced by other things which are entirely independent of the superheating.

At first sight it appears difficult to measure the exact work done by the locomotive in connection with the steam consumption. In consequence of the varying speed, indicator-cards are of no use in this connection. As, however, the comparison is being made between two similar locomotives, it is not necessary to determine the absolute amount of work done. It is enough if the water consumption is measured with the locomotives doing exactly the same work in each case. A locomotive in hauling the same train, over the same division, at the same speed and under similar weather conditions, uses the same amount of steam, and if the locomotive uses the same amount of water on separate trips it may be concluded that the same work has been done.

In the tests one pair of locomotives were 4-4-0 single expansion locomotives, one of which was fitted with the superheater shown in Fig. 2. The other pair was 4-4-0 two-cylinder compounds fitted with the superheater shown in Fig. 1. The first pair took turns in running the same train over the same division. The second pair ran two trains on different divisions, exchanging trains every day. Weather conditions were thus eliminated as far as possible and any runs which showed any considerable variation in water consumption were thrown out. The average results from the runs considered reliable were used for the comparisons. The coal consumptions given are exclusive of unconsumed portions such as cinders, ashes, and clinkers, and the injector overflow has been deducted from the water consumption. It is to be understood that all comparisons between saturated and superheated steam are made on the basis of equal work being performed by the engines.

In comparing the economy it is not sufficient, as with saturated steam locomotives, to compare only the steam consumption. It is of more importance to determine the heat consumption required in the boiler and superheater for the production of the steam, and the temperature of the steam must be considered.

Let l = the total heat required to produce, from water at 32° F. 1 lb. of saturated steam at the given absolute pressure p and the corresponding temperature t.

l' = the total heat for 1 lb. of superheated steam at the given pressure p and the given temperature t'.

v = the volume of 1 lb. of the saturated steam.

v' = the volume of 1 lb. of the superheated steam.

c = the specific heat of the steam.

A = the mechanical equivalent of heat (772).

q = the number of heat units in 1 lb. of feed water.

then $l = 1092 + 0.305\ (t - 32)$

and $l' = l + c\ (t' - t)$

*Abstract of article by Herr. Strahl in *Zeitschrift des Vereins Deutscher Ingenieure* for Jan. 2, 1904, translated by Lawford H. Fry.

also for both saturated and superheated steam

$$l = 857 + ZApv$$

and $l' = 857 + ZApv'$

in which Z is a constant,

$$\text{hence } \frac{v'}{v} = \frac{l' - 857}{l - 857}$$

Now to produce 1 lb. of saturated steam as above the boiler must deliver $l - q$ units of heat, and for superheated steam $l' - q$ or $l - q + c\ (t' - t)$ units.

Then if G is the weight of water consumed per hour with saturated steam

G′ the weight of water per hour for superheated steam

Q the number of heat units required per hour for saturated steam

Q′ the heat for superheated steam.

$$Q = G\ (l - q)$$

and $$Q' = G'\ (l' - q)$$

$$\text{hence } \frac{Q'}{Q} = \frac{G'(l' - q)}{G(l - q)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Now $\frac{Q'}{Q}$ is the relation between the water consumptions, and $\frac{G'}{G}$ is the relation between the heat (or coal) consumptions. Therefore the saving in coal can be calculated from the observed saving in water. Applying this to the tests of the single expansion locomotives:

$$G' = 8070 \text{ lbs.} \qquad \frac{G'}{G} = 0.843$$
$$G = 9570 \text{ lbs.}$$

or a saving of 16 per cent. in the water consumption. Also *p = 184.7 lbs. per sq. in. t′ = 500 deg. F. q = 50 deg. F. and hence from the steam tables t = 375.1 deg. F.

Then $l = 1196$, $c = 0.48$, $l' = 1256$

$$l - q = 1196 - 50 = 1146$$
$$l' - q = 1256 - 50 = 1206$$

$$\frac{Q'}{Q} = 0.84\,\frac{1206}{1146} = 0.88$$

That is to say a saving of 12 per cent., while the observed saving was 12.3 per cent. The close agreement between these two values shows that the efficiency of the boiler has not been reduced by the addition of the superheater, although the tube heating surface has been reduced 19 per cent.

If a comparison is made of the volumes of steam used, it will be found that practically the same volume of steam is used in the locomotive with a superheater as in the locomotive without.

In the case of the single expansion engines

$$\frac{v'}{v} = \frac{l' - 857}{l - 857} = \frac{1256 - 857}{1196 - 857} = \frac{399}{339} = 1.177$$

now $v = 152$ from the tables

therefore $v' = 152 \times 1.177 = 179$

Then the volume of steam used per hour with superheater $= G'\ v' = 8070 \times 179 = 144{,}453$ cu. ft.

and the volume of steam without superheater $= G\ v = 9570 \times 152 = 145{,}464$ cu. ft.

For the compound locomotive

p = 185.7 lbs. per sq. in., t′ = 446 deg. F., q = 50 deg. F.

$l = 1196$, $c = 0.48$ $t = 375$

$l' = 1196 + 0.48\ (446 - 375) = 1230.$

$$\frac{v'}{v} = 1.106 \qquad v' = 169$$

Volume of saturated steam per hour $G\ v = 11{,}620 \times 152 = 1{,}766{,}240$ cu. ft.

Volume of superheated steam $G'\ v' = 10{,}460 \times 169 = 1{,}767{,}740$ cu. ft.

The knowledge of this fact enables a number of valuable conclusions to be drawn.

$$\text{Since } G\,v = G'\,v' \quad \frac{G'}{G} = \frac{v}{v'}$$

$$\text{but } \frac{v}{v'} = \frac{l - 857}{l' - 857} \text{ as shown above}$$

$$\text{hence } \frac{G'}{G} = \frac{l - 857}{l' - 857} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This equation gives the relation between the water consumption with and without superheat and enables one to determine by calculation the saving in water to be expected from any given degree of superheat.

The relation between heat or coal consumption is given by equation (1)

$$\frac{Q'}{Q} = \frac{G'(l' - q)}{G(l - q)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

From the equations the following table has been calculated showing the savings in coal and water with various superheat temperatures and a gage pressure of 170 lbs. per sq. in. The specific heat of superheated steam is taken at 0.48 for temperatures up to 392 degr. F., in accordance with Zeuner, while for temperatures over 572 deg. F., it is taken at 0.60 in accordance with Bach, and for temperatures between these the mean value of 0.54 is used.

			Percentage of saving	
Temperature.	Superheat.	Steam.	Coal.
392 deg. F.	18 deg. F.	2.5 per cent.	2.0 per cent.
410 "	36 "	5 "	3.5 "
428 "	54 "	8 "	5 "
446 "	72 "	10 "	7 "
464 "	90 "	12.5 "	9 "
482 "	108 "	14.5 "	10 "
500 "	126 "	16 "	12 "
518 "	144 "	18.5 "	13 "
536 "	162 "	20.5 "	14.5 "
554 "	180 "	22 "	16 "
572 "	198 "	24 "	17 "
662 "	288 "	34 "	24 "

As was to be expected the savings increase steadily with the degree of superheating, until with a steam temperature of 572 deg. F. a saving of 24 per cent. in water and 17 per cent. in coal can be looked for. The calculated saving for temperatures of 500 deg. and 446 deg. correspond exactly with those observed in the locomotive experiments.

If now the operation of the steam in the cylinder is considered, it follows from the foregoing that the same volume of steam did the same amount of work, whether saturated or superheated. Figure 4 shows theoretical indicator diagrams for saturated and superheated steam expanding adiabatically, from the same point of cut-off. The superheated line drops the more rapidly and therefore indicates that less work would be done. The fact that the same work was done in practice is due to the condensation losses with saturated steam, which are largely avoided with superheated steam.

It is found by* calculation that with 72 deg. F. of superheat and 170 lbs. pressure, 84 per cent. of the saving is due to reduced cylinder condensation, while the remaining 16 per cent. saving is due to the improved action of the steam in expanding. With 198 deg. of superheat 51 per cent. of the saving is due to improved expansion and 49 per cent. to reduced condensation.

As the superheated steam is expanded in the cylinder its temperature is reduced until the point of saturation is reached, from which point the expansion is that of saturated steam. The higher the superheat and the longer the admission, the longer will the steam remain superheated. If the state of superheat is maintained for too long a portion of the stroke it has an injurious effect on the piston and slide valve. This is a strong reason for using moderately superheated steam, particularly for locomotives. The experiments have shown that with steam entering the throttle valve with a temperature of 522 deg. F. it is quite possible to work satisfactorily with the usual simple flat slide valve. Further tests will determine whether the slide valve will stand higher temperatures. It appears probable that with a short cut-off and a large cylinder, a boiler temperature of 536 deg. can be safely used. For compound locomotives, on account of the longer admission in the high pressure cylinder such high temperatures are not admissable with slide valves. Probably the limiting temperature will be about 450 deg. F. The results so far do not encourage the use of higher temperatures in compound locomotives. In the compounds the high pressure valve looses the cooling effect of the exhaust, which is of considerable value in promoting lubrication.

In order to take advantage of the increased power given by the addition of a superheater it is not sufficient to merely cut-off later in the stroke. The losses due to incomplete expansion, high back pressure, and irregular draft on the fire, increased with the length of cut-off, so that the coal saved by the superheater will soon be eaten up by other losses. In order to take full advantage of the superheater the cut-off should be kept the same and the cylinder diameter increased so as to develop the greater power rendered available. It must be borne in mind that the steam production is not the ruling condition, but rather the heat required to produce and superheat the steam.

For example with steam at 536 deg. F. From the table the coal consumption is 85 per cent. of that when doing the same work with saturated steam. The volume of steam used in both cases is the same, say V units per hour. Then if the coal consumption in the superheated engine is increased from 0.85 Q units per hour to Q units per hour as in the saturated steam engine, the steam production will be increased to $\frac{V}{0.85}$ or 1.177 V units per hour. That is to say, if the cut-off is to remain the same the cylinder volume must be increased 17.7 per cent., or, in other words, the diameter must be increased in the proportion of $\sqrt{1.177}$ to 1 or 1.085 to 1. From this it

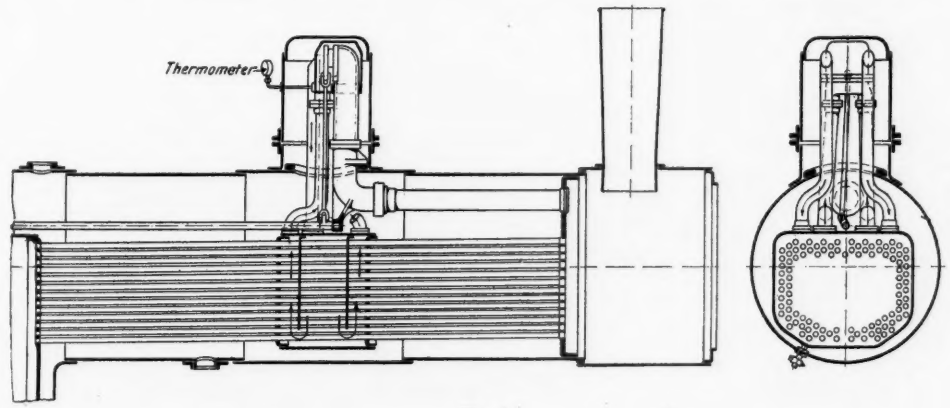


Fig. 1.

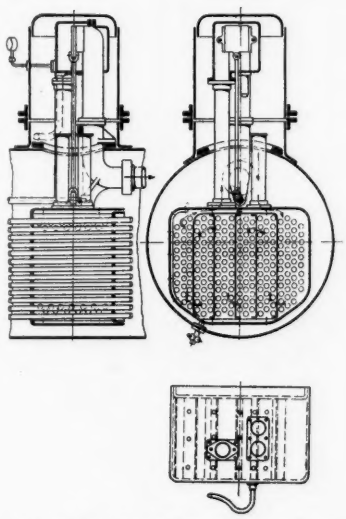


Fig. 3—Modified Design of Superheater—Prussian State Railways.

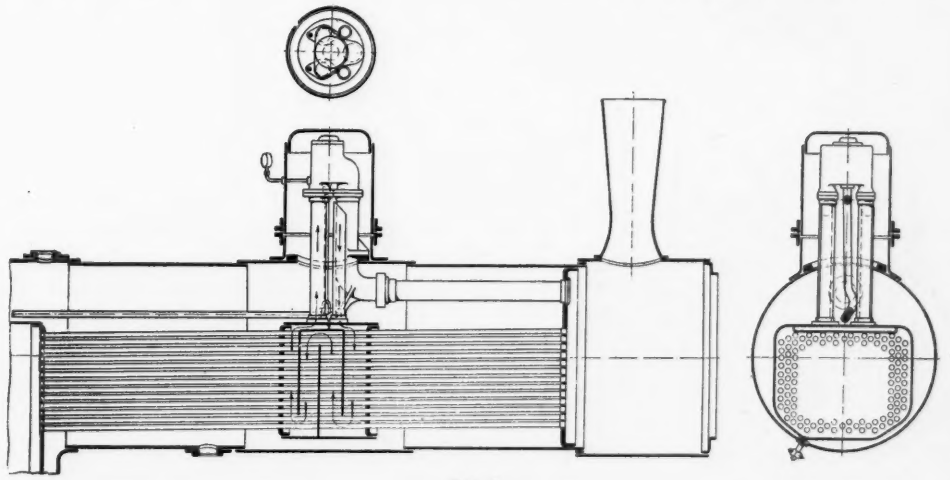


Fig. 2.

Express Locomotives Fitted with Piclock Superheaters—Breslau Division of the Prussian State Railways.

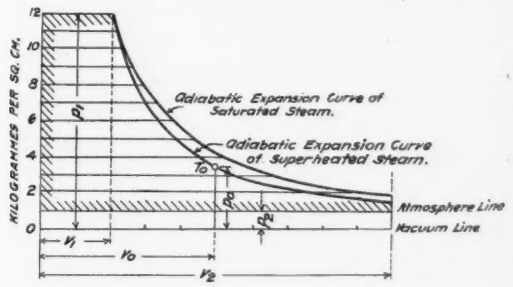


Fig. 4—Theoretical Indicator Diagrams for Saturated and Superheated Steam.

*170 lbs. gage pressure.

*Not reproduced but given in original paper.

follows that if a locomotive with 18-in. cylinders have a superheater (giving steam at 536 deg. F.) added without increasing the boiler dimensions, the cylinders can be increased to 19½ in. diameter, with an increase of 17 per cent. in the tractive power, the fuel consumption remaining the same.

A new 4-4-0 express locomotive can under ordinary conditions at 50 miles an hour develope for each square foot of heating surface about 1.96 h. p. or with 1,270 sq. ft. 650 h.p., while if provided with a superheater giving steam at 536 deg. F. it can furnish steam for 765 h.p., the cylinders being proportionately enlarged.

This not only means a very considerable improvement in the locomotive, but offers a desirable method of bringing to normal conditions the express service, where locomotives are at present working uneconomically because too much is required of them. It also offers a means of accelerating speeds without being forced, as in America, to extraordinary boiler dimensions.

If the results of other tests do not agree with those given above, the analysis which has been carried out will enable the cause of the discrepancy to be detected.

Greater economies than those shown in the table point to the saturated steam locomotive having worked with wet steam. For example, if in the single expansion engine tests the saturated steam had contained 10 per cent. of water, the superheater would have shown coal economy of 14 instead of 12 per cent., and a water economy of 24 instead of 16 per cent., the point of cut-off being the same. Or it may be that a high economy is due to the saturated steam engine being forced by overloading to run with an uneconomically long cut-off. Such tests, while showing the economy obtained by the change in the engine, are without value in determining the saving directly due to the superheating. For this purpose it is necessary to have two similar locomotives, of such dimensions that they work at the same cut-off and perform the same work.

Considerable leakages in slide valves and piston are of less importance with saturated than with superheated steam, as the former, by wetting the surfaces, tends to reduce the leakage. In some cases such leakages may offset the saving effected by superheating. A noticeably small economy points strongly to leakages.

The coal economy may also disappear if the steam economy falls to a certain point. With 162 deg. F. of superheat no coal will be saved if the saving in water is not over 8 per cent., and with steam of 446 deg. F. the water economy must be over 5 per cent. to show any saving in coal. Generally, however, the explanation of small coal economy lies more with the firing than with the superheating. An example of this is given by one of the runs in the tests of the two compound locomotives. Under normal conditions the superheater should have given a saving of 10 per cent. in water and 7 per cent. in coal. The water economy was obtained but the coal economy was 3½ per cent. less than that expected. The locomotives were forced so that the combustion was bad in both cases, on account of the necessarily late cut-off. In the case of the two cylinder compounds this trouble is aggravated by the fact that there are only two exhausts during each revolution, so that the draught is irregular and violent and the amount of cinders carried over to the smoke box is exceptionally large. On the run of 85 miles in 2½ hours with the compound without superheater, 4,500 lbs. of coal were fired on an average. At the end of the run 530 lbs. of cinders (12 per cent.) were taken out of the smoke box, and 350 lbs. of ashes (8 per cent.) were taken from the ash pan and fire-box. Including these losses and the loss by cinders from the smoke stack, which of course cannot be measured, one pound of coal only evaporated 6 pounds of water. With so low an efficiency it is not to be wondered that the actual saving in coal was 3½ per cent., or 154 lbs., less than that calculated. This small additional amount of coal might very easily be fired in 2½ hours on a grate of 24.75 sq. ft.

As has been pointed out above, the remedy for this is the use of larger cylinders, shorter cut-off, and the relief of the heating surface by the use of a superheater.

The results of the experiments described may be briefly summarized as follows:

(1.) With steam entering the throttle at a temperature of 500 deg. F. savings were shown amounting to 16 per cent. in water evaporated and 12 per cent. in coal consumed. With steam at 446 deg. F. in the dome a saving of 10 per cent. in water was obtained.

(2.) The locomotives compared used the same volumes (cubic feet) of steam for the same work.

(3.) The weights of water evaporated were proportional to the specific weights or inversely proportional to the specific volumes of the respective kinds of steam. The saving in steam corresponded to the increased specific volume given by superheating.

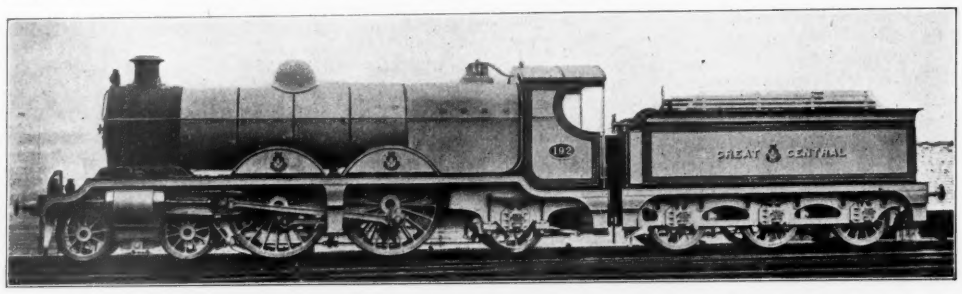
(4.) The steam economy depends only on the superheating and therefore must be the same for the same degree of superheat whether compound or single expansion locomotives are compared, assuming of course that locomotives of the same class are compared with each other.

(5.) Slide valves were successfully used up to the highest temperature of 522 deg. F. Sufficient lubrication of the wearing surfaces was obtained by means of an oil pump.

(6.) In order to take advantage of the superheater to increase the power of the locomotive the cylinders should be increased in the same proportion as the coal consumption with saturated steam would be larger than that of the superheater when doing the same work.

Atlantic-Type Locomotives for the Great Central of England.

The Atlantic-type locomotive shown herewith is one of two engines recently built by Messrs. Beyer, Peacock & Company, of Manchester, for the Great Central of England. The locomotives are to be used for hauling the heavy long-distance express trains between London (Marylebone), Sheffield, Manchester and Grimsby. The company has also two ten-wheel locomotives having nearly



Atlantic-Type Locomotive for the Great Central, England.

the same general dimensions as the Atlantic-type locomotives. In order to test the relative coal consumption, cost of repairs, etc., the two types of locomotives will be used to haul similar trains.

The Atlantic-type engines have Belpaire fire-boxes. The heating surface of each boiler is 1,911 sq. ft., of which 113.1 sq. ft. is in the fire-box. The grate area is 26 sq. ft. and the working pressure is 200 lbs. per sq. in. The 19½-in. x 26-in. cylinders are simple, placed outside the frames, and have a slope of 1 in 48 downwards towards the second driving axle. The driving wheels are 81 in. in diameter and the leading truck wheels are 42 in. in diameter. The tender is carried on six wheels and is fitted with a water scoop. The tank capacity is 3,250 Imperial gallons and the coal capacity is about 5½ tons. The locomotive weighs about 74 tons in working order.

Lackawanna & Wyoming Valley.

As stated in the construction columns of our issue of February 5, 1904, this road which has recently been acquired by the Westinghouse interests will soon begin work on a tunnel 4,000 ft. long under the city of Scranton, Pa. *The Wall Street Journal* says: This is to enable the hauling of heavy freight out of the Scranton depot over a 1 per cent. grade. This tunnel will be six to nine months building. At present the surface tracks out of Scranton toward Pittston are on a 4 per cent. grade. This grade is no obstacle to electric traction, but it would prevent the economical hauling of heavy freight by steam locomotives. The road has already begun to handle freight traffic at night with steam locomotives, supplementing its electric passenger traffic. The road is of standard steam construction throughout and its roadbed is one of the best in the country. An officer of the road says:

"We do not intend to prey upon the business of roads already established, but, by new service and accommodations not practicable upon railroads operated exclusively by steam, we intend to develop traffic not heretofore obtained by existing lines. Our roadway, equipment and terminals will be adequate for all business offered. The stimulation and increase of the general business of the territory by reason of such new facilities will, in our opinion, justify its advent as a common carrier without diminishing the field of usefulness or profit of lines already established, with which it is desired to work in harmony and to mutual advantage." The officers hope that this experiment will prove the forerunner of the development of electric traction on trunk line railroads. The Lackawanna & Wyoming Valley runs through a section where it competes with the Delaware & Hudson, Lackawanna, Lehigh Valley and Reading roads.

A director says: "The steam roads in the Lackawanna and Wyoming Valleys have from necessity subordinated passenger traffic to freight to a great extent. The new road makes passenger traffic the important thing, without ignoring freight. The business the road is doing already justifies the confidence its projectors have in the enterprise. It is now carrying from six to ten thousand passengers a day, and more rolling stock is needed to carry the traffic. On Christmas day it carried 14,000 passengers.

"The old trolley road makes the Scranton-Pittston run in 90 minutes; the new third-rail road makes it in 19. The schedule of the steam passenger trains from Scranton to Wilkesbarre is 31 minutes; the electric trains make the run in several minutes less. The extension to Carbondale will greatly increase the traffic. A feeder to Nanticoke is contemplated, and other feeders will be built as demanded. Trains are run at ten and twenty-minute intervals, and they will be run more often as traffic develops. There is no question that the road's earnings will net a handsome income on the investment."

Northern Pacific Timber Lands.

Mr. Howard Elliott, President, has written to Mr. Gifford Pinchot, Chief of the Bureau of Forestry, at Washington, as follows:

"The Northern Pacific Railway Company is a large holder of timber lands in the Northwestern States, which are now being logged from in more or less irregular methods. Realizing the increasing scarcity of timber, and the probability of a more economical use of forest tracts which we have, and understanding that your foresters lend assistance to landholders in the way of making surveys and plans for economical forest management, I would ask whether it would be possible for the Bureau of Forestry to make surveys and plans for this company, looking toward the forest management of its tracts."

It is highly probable that the suggested arrangement will be made, based on the following standard form of contract:

The Department of Agriculture of the United States and . . . Company mutually agree together as follows:

1. The Department of Agriculture, in pursuance of investigations in forestry, and in order to disseminate a knowledge of improved ways of handling forest lands, shall, after personal study on the ground by its agent or agents, prepare a plan for harvesting the forest crop and reproducing the forest on the land of the said . . . Company, situated and described as follows:

2. The said plan shall be prepared for the purpose of promoting and increasing the present value and usefulness of the said land to its owner, and to perpetuate and improve the forest upon it.

3. Upon the completion of the said plan and its acceptance by the said . . . Company, the Department of Agriculture shall supervise the execution thereof so far as may be necessary.

4. The cost of executing the provisions of this agreement shall be paid as follows:

(*a*) The salaries of all the employees of the Department of Agriculture engaged in fulfilling this agreement shall be paid by the Department.

(*b*) A preliminary visit of inspection, if required, shall be wholly at the charge of the Department.

(*c*) Actual and necessary expenses for traveling and subsistence of the agent or agents of the Department working under this agreement, except as provided in the foregoing paragraph (*b*), shall be paid by the said . . . Company. What are "actual and necessary expenses" shall be determined by the printed regulations of the Department. Expenses under this paragraph (*c*) are estimated, for the preparation of this working plan, at . . . dollars.

(*d*) Necessary assistants shall be furnished by the said . . . Company without cost to the Department. It is estimated that —— such assistants will be required for —— to prepare this working plan.

(*e*) The Department shall not participate in any degree in the receipts and expenses arising from said land, except as above provided.

5. The Department of Agriculture shall have the right to publish and distribute the said plan and its results for the information of lumbermen, forest owners, and others whom it may concern.

6. This agreement may be dissolved by either party upon ten days' notice given to the other.

TECHNICAL.

Manufacturing and Business.

The American Construction Company, of Indianapolis, Ind., has been incorporated, to build bridges, culverts and do other work, by James F. Greer and others.

The Memphis Bridge Co., Memphis, Tenn., is in the market for machinery and equipment for a bridge and structural shop, the material to be new or second-hand.

The Torrance Malleable Iron Company, of Albany, has been incorporated in New York with a capital of $30,000, by F. V. Griesman, M. E. Woollard and others.

W. E. Bushnell has severed his connection with the Kalamazoo Railway Supply Company, and started a new business in railroad supplies on his own account in Kalamazoo.

The Knickerbocker Construction Company has been incoorporated by James F. Cotter, I. C. Clow and others, of Camden, N. J., with a capital of $100,000, to build railroads, bridges, etc.

The Dahlstrom Metallic Door Company, of New York, has been incorporated with a capital of $30,000, to make metal doors, etc. Charles Dahlstrom, Carl A. Lundquist and C. E. Swanson are incorporators.

The Western Railway Signal Company, of Camden, has been incorporated in New Jersey with a capital of $60,000, to make railroad supplies. The incorporators are John G. Bennett, Walter C. Beckworth, Philip Peter and others.

The district offices of the Westinghouse companies in Baltimore, Md., were burned out by the great fire last

week, but new offices have been secured at 221 N. Calvert street, where all the business will be carried on as before.

Bids will be received by H. Fernstrom, Chief Engineer, New York Central & Hudson River Railroad, Grand Central Station, New York, Feb. 23, for dredging—scow measurement—at Weehawken, N. J. The approximate amount of material to be removed is about 27,000 cu. yds. All material to be wasted.

Charles B. Holdrege, formerly Manager of the Railway Supply Department of Hibbard, Spencer, Bartlett & Co., has been appointed General Sales Agent for the Franklin Railway Supply Co., the Franklin Manufacturing Co. and the Keystone Drill Co., with office in the Western Union Building, Chicago.

The T. H. Symington Company and the Baltimore Railway Specialty Company were sufferers by the recent fire in Baltimore. They have opened a new office at 706 St. Paul street, Baltimore. The foundries were not in the fire section, and the company is prepared to take care of all business; but has had to ask the indulgence of its friends on account of the destruction of the offices.

Bids will be received by H. Fernstrom, Chief Engineer, New York Central & Hudson River Railroad, Grand Central Station, New York, Feb. 29, for the delivery and erection, in complete and satisfactory working condition, in the Carroll street freight yard, Buffalo, N. Y., of one 40-ton electric auxiliary hoist, 4-motor, single trolley, traveling bridge crane, with runway and supporting structure.

Dodge & Day, Modernizing and Contracting Engineers, Nicetown, Philadelphia, Pa., are putting an engine into the power house of the Link-Belt Engineering Company, Philadelphia. It is a 340-h. p. Buckeye vertical cross-compound engine, direct connected to two General Electric 100-kw. continuous-current compound-wound generators. The boiler plant of the same company may be fitted with under-feed stokers.

Iron and Steel.

Carrigan, McKinney & Company, of Scottdale, Pa., has put its blast furnace in operation, after an idleness of about three months.

The Harriman lines have placed orders for 53,000 tons of rails with the Illinois Steel Company and the Tennessee Coal & Iron Company, reports say, at the regular schedule price of $28 per ton.

On the basis of the blast furnace reports for January, pig iron is now being made in this country at the rate of 11,700,000 tons a year, which compares with a December basis of 10,100,000 tons a year, and of a September basis of 19,000,000 tons a year. The improvement in the output for January over that of December is encouraging, as showing a decided increase in consumption. The outlook for a heavy volume of business in structural steel due to the Baltimore fire and the revival of building operations generally is becoming noticeable.

Pennsylvania Tide-Water Terminal at Greenville.

In our issue of Feb. 5 the small map and description of the tide-water terminal of the Pennsylvania at Greenville, were not accurate in this particular. The tracks of the Pennsylvania crossing Newark Bay into Greenville are not built north of the Lehigh tracks, but are built directly south of the same, both companies using the same drawbridge over Newark Bay.

Automatic Block Signals.

An officer of the Missouri Pacific informs us that the contract for automatic block signals which that company has let to the Union Switch & Signal Company embraces the lines from St. Louis westward to Washington, 54 miles, and from St. Louis southward to De Soto, 42 miles, a total of 96 miles.

Paint and Varnish Special Train.

What is believed to be the largest single shipment of paint ever known was made lately by the Sherwin-Williams Co. from Cleveland to Fort Worth, Texas. A special train of 17 cars was chartered and ran "solid": Cleveland to Chicago, over the B. & O. R. R.; Chicago to Kansas City, on the Rock Island; Kansas City, over the Santa Fe to Fort Worth, where the train was broken up and the cars distributed among the company's agents in Texas. No attempt was made to conceal the movement of the special train. It ran by daylight only and was decorated with banners explaining the nature of the shipment. Local newspapers along the line, and posters at stations, announced its coming. The great paint company's representatives on the train showed no reluctance in being interviewed; quite properly, for the undertaking seems to be without precedent.

Whipple's Switch Heater.

At Michigan City, Ind., on the Michigan Central, a switch has been equipped with a device invented and patented by Mr. F. S. Whipple, of that place, for keeping the rails and connections warm so that in a snowstorm they will not become clogged by snow or ice. An officer of the road reports that during a recent storm, accompanied by extreme low temperature, the stock rails, switch points and connections were kept free from snow for a length of 4 ft. The heater consists of a rectangular sheet metal box about 6 ft. long, placed beneath the rails just back of the switch points, the ballast between two sleepers being taken out to make room for the box. In this box are two gasoline burners, one under each stock rail, and fuel is supplied by a pipe leading from a reservoir near the switch stand, which is supported about 3 ft. above the level of the track. The top of the box is dish-shaped, so that rain water or melted snow flows to the center and runs down through a suitable pipe, and a tile set in the ground, to the ditch or to the ground below the frost line. The sleepers are protected from burning by asbestos paper between the box and the tie. This box is light enough to be portable and may be taken out in the summer, the drain tile being then covered.

The Peters Automatic Block Signal.

The Chicago, Cincinnati & Louisville has on trial on a section of its line, single track, near North Judson, Ind., an automatic signal, devised by Robert D. Peters, of Knox, Ind., who describes it as follows:

The experimental installation at North Judson contains six blocks, each block being approximately one mile long. The signals are set in the middle of the blocks instead of at the entrance, and are all on one side of the track. The circuits provide for protecting trains two blocks ahead and two blocks in the rear, and an indication is provided to show the direction in which a train is moving. The signal mechanism is contained in a circular box somewhat like a Hall disk-signal case. A semaphore blade projects from this box at the top, or at one side, or the other side, according to the desired indication; and for the night indications there is a lamp in the upper part of the box.

In the experimental installation a blade extending upward gives the danger indication. When a train enters the first block of the system, if it is unoccupied and the second block is also clear, the semaphore blades of both go to "clear," which is horizontal, extending away from the track; and each signal will remain at clear until the train has passed two and one-half blocks beyond it; but should there be a train approaching in either of the blocks ahead the signal would not go to clear; it would remain at danger. If the obstructing train is going in the same direction as the entering train the blade goes to "caution," which is horizontally toward the track.

There is in the despatcher's office an instrument called a trackoscope which indicates automatically the location of trains. A daily record of the movements of trains through the blocks has been kept by means of this instrument. Mr. W. I. Allen, until recently General Manager of the road, says that in the tests the apparatus worked well. The Peters Signal Company, Knox, Ind., owns the patents.

The Improvements on the London Metropolitan.

The Metropolitan underground railway of London, although not yet working electrically, has won back some of the traffic which it lost when the Central London tube line commenced its operations. In 1899, the year before the opening, it carried at the rate of 96 millions of passengers a year, but the competition resulted in a decrease of over eight millions in the following year. Many improvements were introduced with a view to meeting this rivalry, and these have already borne fruit, for Colonel Mellor informed the shareholders at their meeting on January 29 that the passengers carried in 1903 totalled 94,000,150, so that without receiving benefits estimated to follow electrical working, the business has been already brought back to within 2 millions of the figure which obtained before the tube competition began. There seems to be little doubt that one important factor in last year's increase of traffic is the scare which was caused among tube passengers—especially the midday lady-shoppers, who seem to have been exceptionally nervous—by the disaster on the Paris Metropolitan. That the London tube lines were seriously affected is borne out by the few facts that have so far been made public respecting the half year's working. If the present enterprising spirit continues to attract back the old traffic during the current half year, it is quite within possibility that by the time electric traction equipment operations are completed the Metropolitan will have entirely regained the ground lost. It has the advantage of nearness of its tunnels to the surface, obviating the use of electric or hydraulic elevators which are essential in the tube systems. Experience seems to prove that passengers prefer walking short flights of stairs to riding in elevators. The directors calculate that if they are able to get back traffic at the rate they are now doing, notwithstanding the atmospheric unpleasantness and some other drawbacks which are unavoidable with the present method of working the trains, they will be able to increase their custom by "at least 50 per cent." when electric traction is working, with purified atmosphere, clean tunnels, faster service and more comfortable trains. The probable date of electric working depends entirely upon the power station which is said to be almost ready to receive the main generating machinery which the British Westinghouse Company are building. The conductor rails are being placed in position along the tracks, and some of the rolling stock has been delivered. It is thought that in about six months some portion of the system will be electrically working. The company now has a bill before Parliament converting and consolidating its stocks and raising an additional £750,000 capital.

THE SCRAP HEAP.

Notes.

One result of the new railroad law in Canada is to abolish half rate tickets for clergymen, which heretofore have been universal on the railroads of the Dominion.

A Philadelphia paper says that 36 baggagemen of the Pennsylvania Railroad are to have their runs lengthened about 90 miles; they now run between Philadelphia and Pittsburg, but are to run between Jersey City and Pittsburg.

According to a press despatch from St. Louis, the reduced freight rates which have been adopted by the State Railroad Commissioners of Missouri and which have been ordered to go into effect March 1, will not cause large and sweeping reductions, as has been stated, but will require a small reduction in a limited number of tariffs.

The Pennsylvania Railroad Pension Department has now been in operation four years, and 2,136 employees have been retired. Of these 527 have died. The total amount paid out in pensions during these four years has been $1,224,087. The payments in 1903 were $359,374, which is almost 50 per cent. larger than the sum paid in the year 1900. Of the total number pensioned in the four years 426 were under 70 years old—that is, within the optional limits 65-69.

According to a press despatch, the city government of Atlanta, Ga., has passed an ordinance establishing a standard of pleasantness or acceptability of street car passengers in the matter of odor. It appears that this unusual procedure has been brought about by the large number of workmen from a guano factory who frequent the cars of the city and who are offensive to other passengers. The street railroad company has now put on separate cars for the guano workers.

In the suit of the State of Iowa against the Illinois Central and several other railroads indicted for conspiracy in establishing demurrage charges, the District Court in Iowa has declared the anti-trust law of that State unconstitutional. The suit was based on the action of the railroads in agreeing on $2 a day as the demurrage rate on freight cars at Waterloo. One of the sections of the law provides that the penalty for violation shall be not less than 10 per cent. of the capital of the offending company or person. Under this section three of the railroads would be liable to fines of $2,280,000. Naturally, the judge holds that such a provision takes property without due process of law.

A press despatch from Chicago, dated Tuesday last, says that the Burlington and the Alton have announced a rate of 15 cents per 100 lbs. on grain from Missouri River points (Kansas City) to Baltimore, Newport News and Norfolk. This rate is only 3 cents higher than the rate now prevailing from Kansas City to the Gulf of Mexico, and it is 1 cent lower than the regular rate from St. Louis to the Atlantic seaboard. This apparently makes the rate accruing to the lines east of St. Louis about as low as the lowest which prevailed three or four years ago, when large quantities of grain are said to have been taken from Chicago to Atlantic seaboard points at 10 cents per 100 lbs., or less.

A Unique Record.

Thomas R. Smith and his wife probably have served one railroad longer than any other man and wife in the country. Mr. Smith has been agent of the Wabash Railroad at Jacksonville, Ill., for 45 years, and his wife has been the operator in the telegraph office at the same place for 44 years. Both are still in the service.

Proposed Fire Safeguards in Fourth Avenue Tunnel.

The New York State Board of Railroad Commissioners has recommended to the New York Central & Hudson River R. R. Company that in the Fourth avenue tunnel, New York City, the two center tracks of which are mostly in open cut, be equipped with fire apparatus. In each city block (a distance of about 260 ft.) there should be a standpipe connected with the city fire department pipes, and at various points in the tunnel alarm boxes connected directly with the city fire department wires. It is also recommended that fixed ladders be put in along the east wall, with trap doors in the roof at 66th and 79th streets, to enable firemen to quickly get into the tunnel, and that ladders be hung on the wall every 260 ft., so that any one can climb out of the tunnel in case of need.

A Special Use for Concrete Piling.

The use of concrete piles in wet soil no doubt saved a large building in St. Louis. A sewer is being constructed in the alley adjoining the St. Louis News Company's building at 1010 Locust street, and a partial undermining of the wall of this building caused it to settle, threatening collapse. The wall was torn out and steps taken to make the building permanently safe, but difficulties were at once encountered in an attempt to provide a suitable foundation, as the sewer was in the way. It was decided that piling would serve the purpose, but it was feared that there would be too much moisture in the ground from the sewer for the safety of wooden piling. Resort was therefore had to concrete piling and 28 piles, 20 ft. long, 22 in. in diameter at the top and 6 in. at the bottom, were driven. The Raymond Concrete Pile Company, Chicago, did the work.

Failure of a Blacklisting Complaint.

The Supreme Court of Indiana has decided the case of John W. Young, who sued the Wabash Railroad for damages for blacklisting him; and holds that there was no cause for action. Young was an organizer of the Order of Railroad Telegraphers, and left the Wabash voluntarily on a strike. Afterward he was unable to get employment on other roads because the Wabash had told certain roads that he was a member of a labor organization and was a labor agitator. The court holds, first, that the law forbidding blacklisting applies only to employees who have been discharged, and therefore does not apply to Young's case; second, as Young was a labor agitator, the statement of the road apparently was true.

It was not alleged that the statements had or would injure Young, or that any odium attached to members of such organizations or to labor agitators.

Increases in Ocean Passenger Traffic.

The annual statement of the Landing Agent of the Port of New York shows an increase of 21,428 in the number of first and second class passengers arriving at New York from Europe during the year just closed and an increase of 68,683 in the arrivals of steerage passengers. The North German Lloyd Bremen service brought the greatest number of steerage passengers during the year, a total of 89,503, with 89 voyages of ships, as against 81,074 passengers last year, with 85 sailings. The Bremen steamers of the North German Lloyd also brought over 32,184 cabin passengers during the year, as against 24,588 in 1902. The Hamburg ships of the Hamburg-American Line in 84 voyages brought over 88,728 steerage and 22,792 cabin passengers, as against 84,295 steerage and 20,106 cabin passengers in 1902. The Red Star as usual comes third in the list with 54,726 steerage passengers and 8,866 cabin passengers. The influence of the larger ships of last year is shown in the relative increases in number of passengers carried over number of voyages.

The Central New England Purchase.

President Mellen, of the New York, New Haven & Hartford, is quoted as follows regarding the purchase by his company of the Central New England: In acquiring control of the Poughkeepsie bridge system, the Consolidated road is but extending its lines across the Hudson River, making direct rail connection with roads it is already exchanging business with. The ferry at Fishkill was well enough for a limited business, but our interchange with connections west of the Hudson has so increased in volume in recent years that it has become impossible without large expenditure to use it longer, and the present winter has forced upon our consideration its great limitations. Could we have acquired the bridge and its approaches, say between Hopewell Junction and Campbell Hall independently of the rest of the system, we should have been better pleased, but the roads had become so welded together it was a question of taking the whole or nothing, and being forced to secure a better connection than the ferry, it seemed wise to take the whole.

No Agreement Regarding Trans-Atlantic Rates.

At a conference last week, where agents and representatives of practically all the steamship lines operating between the various Atlantic ports and the United Kingdom were present, an attempt was made to obtain concert of action with regard to the current demoralization in the trans-Atlantic freight business. The minimum rate agreement, which the lines have been observing more or less faithfully for upwards of two years, is about to expire by limitation, and an endeavor was made to find some common ground of renewing it. No agreement was reached, however, and the conference broke up sine die, with a prevailing belief that the freight situation was likely to become so entirely demoralized that this in itself would have the effect of forcing the lines together. The minimum rate agreement was entered into about the time of the organization of the Morgan steamship combination, and provided that on grain, flour, provisions and certain other main articles of cargo, no line of the Atlantic coast should accept less than certain minimum rates. Last fall grain was withdrawn from the list of these articles, and it is now said that the entire market is practically an open one.

Damage to Susquehanna River Bridges.

Extensive ice gorges in the Susquehanna River, one of which extends from Limeridge, Columbia Co., Pa., to Kipp's Run, in Northumberland County, a distance of more than 30 miles, have destroyed and damaged a number of important bridges. The State Board of Public Buildings and Grounds will be asked to expend about $500,000 during the current year for new bridges to replace structures destroyed. The bridge connecting Berwick and Nescopeck was wrecked and subsequently was burned to lessen the danger to other bridges still standing. This was an ancient double frame structure and was the oldest bridge on the Susquehanna River, having been originally put up in 1816 and rebuilt in 1836. It was a five-span structure, 1,250-ft. long, owned jointly by Columbia and Luzerne counties. The state will be asked to assist in building a modern steel bridge at this point. The three completed spans and false work of the steel bridge being built by Columbia County between Willow Grove and Mifflinville, over the Susquehanna, were also wrecked by the flood and ice. The destruction of these two bridges means a loss of about $300,000. About $50,000 had already been paid to the contractors, the King Bridge Co., on the Mifflinville structure.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

The Iron and Steel Institute.

The annual general meeting of the Iron and Steel Institute will be held in London at the Institution of Civil Engineers, May 5 and 6.

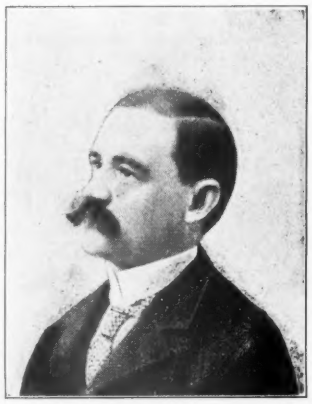
Franklin Institute.

A meeting of the sections was held in Philadelphia, Feb. 11. The programme included a paper on "The Corrosion of Metals Underground by Electrolysis," by A. A. Knudson, New York.

PERSONAL.

—Mr. Simon Borg, of the New York banking firm of Simon Borg & Company, died at his home in New York City February 10, at the age of 64. Mr. Borg was interested in a number of railroad properties and at one time was President of the New York, Susquehanna & Western.

—On the first of this month Mr. George M. Houghton became General Manager of the Bangor & Aroostook.



Mr. Houghton has been connected with this company since 1895. His railroad service dates from 1876, when, as a clerk, he entered the office of the general passenger agent of the Passumpsic Railroad, now a part of the Boston & Maine. He stayed with this company until 1887, when, after having for two years been passenger accountant and auditor, he became chief passenger rate clerk on the New York & New England. On June 1, 1895, he went to Bangor as General Passenger Agent of the Bangor & Aroostook, and on January 1, 1901, was advanced to the position of Traffic Manager, which position he held at the time of his promotion.

—Mr. J. N. Luce, General Attorney of the New Orleans & Northwestern, died at Roanoke, Va., on Feb. 6.

—Mr. John A. Roche, formerly Mayor of Chicago, who died in that city suddenly on February 10, was for four years (1893-1897) President of the Lake Street Elevated Railroad. He was formerly for many years Northwestern representative of J. A. Fay & Company, of Cincinnati, and later was Vice-President of the Crane Elevator Company. Still later he held a prominent position with the Otis Elevator Company.

—Mr. Joseph T. Dodge, a well-known civil engineer, died at Madison, Wis., on February 6. He was born at Barre, Vt., in 1823, was educated at the University of Vermont, and in 1845 began work as a civil engineer on the Vermont Central. In 1853 he went to Wisconsin, where he had charge of the construction of the Chicago, Milwaukee & St. Paul between Stoughton and Madison. In 1887 he retired from professional work.

—Mr. Putnam A. Bates, Assistant Secretary and Sales Manager of the Crocker-Wheeler Co., announces that he has resigned his position and will retire from that company March 1 next. Mr. Bates has formed a partnership with Mr. John Neilson, who was until recently Assistant Secretary and Assistant Treasurer of the New York & Stamford Electric Railway, and under the firm name of Bates & Neilson, will conduct the general practice of consulting electrical engineering, with offices in New York City. Mr. Bates is a graduate of Columbia, and his seven years of wide and varied experience with the Crocker-Wheeler Co., during which time he studied electrical properties in nearly every state in the United States, make him especially well fitted for his new work. He is a member of the American Institute of Electrical Engineers and the New York Electrical Society. He has planned a trip to England the latter part of February, to be gone a month or six weeks, and will combine pleasure and a much-needed rest with the study of conditions in that country.

—Mr. E. A. James, who was recently promoted to be Manager of the Canadian Northern, with office at Winnipeg, Man., began his railroad career at the age of 15, on the Grand Trunk, as an operator at Madoc, Ont. This was in 1880. The following year he went to Winnipeg and took a position in the Canadian Pacific headquarters' office as telegrapher. He afterwards became relieving agent and subsequently was made train despatcher. In 1891 he was appointed Chief Train Despatcher and five years later was promoted to the Superintendency of the Manitoba Division. He remained in that position until 1901, when the Canadian Pacific created the office of Superintendent of Transportation, and Mr. James was appointed to fill it. In this position Mr. James exercised authority throughout the entire western division, about four thousand miles of road.

—Mr. Robert H. Sayre, Jr., for many years Assistant Superintendent of the Bethlehem Iron Company, and afterward the Bethlehem Steel Company, died at Thomasville, Ga., on February 11, at the age of 55.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The general office building having been burned in the great fire of February 7 and 8, the officers will have temporary quarters in various parts of Baltimore. Motive power at Mt. Clare shops; accounting department at the Heywood Building, Pratt and Greene streets; engineering forces at Mt. Royal Station, and all others at Camden Station.

Buffalo & Susquehanna.—See Buffalo, Bradford & Kane, below.

Buffalo, Bradford & Kane.—C. W. Goodyear, hitherto Second Vice-President of the Buffalo & Susquehanna, has been appointed Vice-President of the B., B. & K., with office at Bradford, Pa., succeeding R. H. England, resigned.

Canadian Pacific.—H. H. Vaughn, hitherto Assistant Superintendent of Motive Power of the Lake Shore & Michigan Southern, has been appointed Superintendent of Rolling Stock of the C. P., with headquarters at Montreal, Que.

Central New England.—L. S. Miller has been appointed General Manager, with headquarters at Hartford, Conn., succeeding D. A. Geraty, resigned.

Chesapeake & Ohio.—The office of W. F. Hite, Assistant General Freight Agent, has been removed from Richmond, Va., to Huntington, W. Va. A. P. Gilbert, hitherto Assistant to the General Freight Agent at Richmond, has been appointed Assistant General Freight Agent at Richmond, and C. H. Lehman, hitherto Divisional Freight Agent at Huntington, has been transferred to Richmond in charge of the Eastern Division, succeeding J. R. MacMurdo, deceased.

Chicago & Alton Railway.—F. S. Winston has been appointed General Solicitor, with office at Chicago, Ill., succeeding William Brown.

Chicago, Rock Island & Pacific.—L. B. Allen, hitherto Superintendent at Cedar Rapids, Iowa, has been appointed Superintendent at Chicago, Ill., succeeding F. O. Melcher. H. P. Greenough, hitherto Superintendent of the Chicago, Rock Island & Gulf at Amarillo, Mex., has been appointed Superintendent at Cedar Rapids of the C., R. I. & P., to succeed Mr. Allen. (See Choctaw, Oklahoma & Gulf.)

Choctaw, Oklahoma & Gulf.—F. O. Melcher, hitherto Superintendent of the Chicago, Rock Island & Pacific, at Chicago, has been appointed General Superintendent of the C., O. & G., with headquarters at Little Rock, Ark., succeeding W. W. Wentz, Jr., resigned.

Delaware & Hudson.—T. B. Dixcy has been appointed Assistant to the Second Vice-President, with office at Albany, N. Y.

Delaware, Lackawanna & Western.—C. S. Jewett has resigned the position of Foreign Freight Agent, at New York City. His successor is C. W. Ten Broeck, for the past two years Industrial Agent. W. P. Cotton, Advertising Agent, passenger department, will assume the duties of Industrial Agent, in addition to those of Advertising Agent.

Detroit Southern.—J. B. Flanders having resigned, the office of General Superintendent has been abolished. The jurisdiction of J. C. Gleason, Superintendent of the Southern Division, has been extended over the entire road. Heads of departments heretofore reporting to the General Superintendent, will hereafter report to him; except that the Maintenance of Way and Bridge and Building Departments will be under the direct supervision of George Crocker, Chief Engineer, who will also report to the Superintendent.

El Oro Mining & Railway.—W. J. Lilly has been appointed Master Mechanic, with headquarters at El Oro, Mex., succeeding D. M. Haynes.

Hannibal & St. Joseph.—Henry Miller, General Superintendent, will assume the duties of General Manager also.

Kansas City, Memphis & Birmingham.—See St. Louis, & San Francisco, below.

Kansas City Southern.—E. Phenneger has been appointed Superintendent, with headquarters at Texarkana, Texas.

Lake Shore & Michigan Southern.—See Canadian Pacific.

Mexican Central.—H. W. Ridgeway has been appointed Master Mechanic, with headquarters at City of Mexico, succeeding C. W. Wincheck.

Mississippi River, Hamburg & Western.—See St. Louis, Iron Mountain & Southern.

New York, New Haven & Hartford.—Superintendent T. H. Fennell, of the Hartford Division, has been appointed Superintendent of the New York Division, with headquarters in New York. G. H. Wilson, who has been Acting Superintendent of the New York Division, will succeed Mr. Fennell as Superintendent of the Hartford Division.

J. G. Parker has been elected Secretary, to succeed W. D. Bishop, Jr. Mr. Bishop has been elected a Director, to succeed his father, the late W. D. Bishop.

Ohio Commissioners of Railroads and Telegraphs.—E. W. Purritt, of Toledo, has been appointed Commissioner, succeeding J. C. Morris.

Pennsylvania.—Owing to ill health, George W. Creighton, General Superintendent of the Pennsylvania Railroad Division, has been granted an indefinite leave of absence, and M. Trump, General Superintendent of Transportation, will be in charge of Mr. Creighton's work.

Philadelphia & Reading.—R. Tull has been appointed Treasurer, with office at Philadelphia, Pa., succeeding W. A. Church, retired.

St. Louis & San Francisco.—J. A. Quinn has been appointed Superintendent of the Western Division, with headquarters at Neodesha, Kan., succeeding H. H. Brown, who has been transferred to Memphis, Tenn., as Superintendent of the Southern Division of the St. L. & S. F., and the Kansas City, Memphis & Birmingham Railroad, succeeding Mr. Quinn.

St. Louis, Iron Mountain & Southern.—J. D. Moore, hitherto General Superintendent and General Freight and Passenger Agent of the Mississippi River, Hamburg & Western, has been appointed Superintendent of the Central Division of the St. L., I. M. & S., with headquarters at Van Buren, Ark., succeeding R. P. Dalton, resigned.

Wabash.—L. J. Ferritor has been appointed Division Superintendent, with headquarters at Peru, Ind.

LOCOMOTIVE BUILDING.

The Missouri, Kansas & Texas is reported to be figuring on 10 locomotives.

The Pennsylvania will, it is reported, add 250 locomotives to its equipment during 1904. The greater part of these locomotives will be built at the Altoona shops.

The National Railroads of Buenos Ayres, Argentina, have awarded a contract for four narrow gage locomotives to S. B. Hale & Company, local agents of the Baldwin Locomotive Works.

The Lehigh & New England, as reported in our issue of Feb. 5, is having three simple consolidation (2-6-0) locomotives built at the Baldwin Works, for March, 1904, delivery. These locomotives will weigh 140,000 lbs., with 120,000 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 56 in.; straight boiler, with a working steam pressure of 185 lbs.; 230 tubes, 2¼ in. in diameter and 13 ft. 4½ in. long; fire-box, 112⅛ in. long and 42¾ in. wide; tank capacity, 4,000 gallons of water, and coal capacity, eight tons. Special equipment includes: Westinghouse brakes, Magnesia boiler lagging, Sterlingworth brake-beams, American Brake Shoe & Foundry Co.'s brake shoes, Janney couplers, Ohio injectors, U. S. piston rod and valve rod packings, Ashton safety valves, Leach sanding devices, Nathan sight-feed lubricators, and cast-iron wheel centers.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 10 simple Chautauqua (4-4-2) locomotives from the Brooks Works of the American Locomotive Company, for May, 1904, delivery. These locomotives will weigh 186,000 lbs., with 100,000 lbs. on drivers, cylinders 20½ x 26 in., 78-in. drivers, wagon-top boiler, with a working steam pressure of 200 lbs.; heating surface, 3,212 sq. ft.; 362 iron tubes, 2 in. in diameter and 16 ft. long; fire-box, 97 in. long and 68 in. wide; grate area, 45 sq. ft.; tank capacity, 7,500 gallons of water, and 12 tons of coal. Special equipment includes: Corrington and American air-brakes, Magnesia boiler lagging, Diamond special brake-beams, Janney couplers, Pyle-electric headlights, Nathan injectors and sight-feed lubricators, Jerome piston rod packings, Brooks valve rod packings, Curtis sanding devices, Gold steam heat equipment, Latrobe driving wheel tires, Star steam gages, Standard Steel Works' truck and tender wheel tires and cast steel wheel centers.

CAR BUILDING.

The Pacific Coast Line is building 20 logging flat cars at its Columbia and Puget Sound shops. The cars will weigh 24,500 lbs., and will be 41 ft. long, 8 ft. 6 in. wide and 4 ft. 2 in. from top of rail to floor. Special equipment includes: Carnegie steel axles, Lappin brake-shoes, Westinghouse brakes, Tower couplers, Haskell & Barker trucks, Griffin wheels and Railway Steel-Spring Co.'s springs.

The Cudahy Packing Company, South Omaha, Neb., as reported in our issue of Feb. 12, has ordered 235 beef refrigerator cars from the Western Steel Car & Foundry Co., for April, 1904, delivery. Special equipment includes: Commonwealth Steel Co.'s bolsters, Simplex brake-beams, American Brake Shoe & Foundry Co.'s brake shoes, Westinghouse air-brakes, More-Jones Brass & Metal Co.'s brasses, Latrobe couplers, Miner draft rigging, Ryan dust guards, Woodman journal boxes and journal box lids, F. W. Bird & Son's roofs and Pittsburg Steel & Spring Co.'s springs.

The St. Louis & Belleville (Electric) is having 200 freight cars built at the Madison Works of the American Car & Foundry Co.

The St. Louis Refrigerator Car Company is having 500 freight cars built at the St. Louis Works of the American Car & Foundry Company. This order was reported as having been placed, in our issue of Jan. 8.

The Wrightsville & Tennille is in the market for one first class passenger coach and one combination baggage, mail and passenger car.

The Wabash has been asking bids on a large number of freight cars, but the order will not be placed for some time to come. The cars on which bids were asked are said to be as follows: 600 steel gondolas of 80,000 lbs. capacity; 600 wooden gondolas of 80,000 lbs. capacity; 100 flat cars of 80,000 lbs. capacity, and 1,000 box cars of 60,000 lbs. capacity.

The East St. Louis & Suburban has ordered 200 coal cars from the American Car & Foundry Co.

The Long Island has ordered 30 ballast cars from the American Car & Foundry Co.

The American Car & Foundry Co. has miscellaneous orders for 62 cars.

The Wheeling & Lake Erie has ordered 15 coaches, four combination smoking and baggage cars, three baggage cars, two dining cars and one parlor car from the American Car & Foundry Co.

The Grand Trunk denies being in the market for 1,000 freight cars, as reported in our issue of Feb. 5.

The Queen & Crescent has ordered 2,400 freight cars. This order is divided as follows: American Car & Foundry Co., 1,475; Mt. Vernon Car & Manufacturing Co., 725; Southern Car & Foundry Co., 200.

The Canadian Pacific is building five dining cars and 40 sleeping cars at its own shops at Hochelaga, Que.

F. M. Hicks, of the Hicks Locomotive & Car Works, has sold the following equipment: Duluth, Virginia & Rainy Lake, one combination coach; Midland Valley, two combination coaches and 10 box cars; Butte County, one first-class coach, one observation coach and one combination coach; Patton & Gibson Co., Contractors, 20 flat cars; Toledo Interurban Construction Co., four center dump ballast cars; Newton & Northwestern, one coach, one combination car and 10 box cars, and W. R. Pickering Lumber Co., 15 flat cars.

The Ingoldsby Automatic Car Company has ordered 22 dump cars, of 80,000 lbs. capacity, from the Mt. Vernon Car & Manufacturing Company, for February delivery. Special equipment includes: Monarch brake-beams, Mt. Vernon Car & Mfg. Co.'s brake shoes and wheels, Westinghouse air-brakes, More-Jones Brass & Metal Co.'s brasses, Tower couplers, Miner draft rigging, McCord journal boxes, Scullin-Gallagher Iron & Steel Co.'s bolsters, and Pittsburg Spring & Steel Co.'s springs.

BRIDGE BUILDING.

ALTOONA, PA.—At a recent meeting of the Select Council, an ordinance was introduced authorizing the mayor to make an agreement with the Pennsylvania Railroad and the Logan Ferry Electric Railroad to replace the bridge over the Pennsylvania tracks at 17th street; also to secure certain ground for approaches to the 24th street bridge.

ATLANTA, GA.—The railroads have submitted a proposition to the city for building a viaduct from Hunter street to Gilmer street, at a cost of about $125,000, plans for which have been made by R. M. Clayton, City Engineer.

BERRYVILLE, VA.—The Board of Supervisors of Clark county has ordered the building of two bridges over Shenandoah River, one at Castleman's Ferry and one at Berry's Ferry, at a total cost of $39,700.

BLACKSTONE, VA.—Bids are wanted, March 2, by R. S. Beville, Chairman of the Board of Supervisors, for building a steel bridge 75 ft. long, with one span of 40 ft. and two 17½-ft. spans, over the Norfolk & Western tracks.

BLOOMSBURG, PA.—The ice in the Susquehanna River has carried away a bridge at Berwick, and also a new steel bridge under construction at Mifflinville.

BOSTON, MASS.—The new bridge to be built over the Charles River on Western avenue, between Boston and Cambridge, is to have a draw not less than 55 ft. wide, and will cost about $50,000 to each city.

The Senate has been petitioned to authorize the Harbor and Land Commission to build a bridge over the Reserve channel in Boston, to connect I street with Summer street.

BRANFORD, CONN.—The Secretary of War has ordered the building of a draw in the bridge over Branford River, connecting Branford and East Haven, or the removal of the structure.

CARTHAGE, TENN.—This city has asked Smith County to contribute $16,000 towards building a bridge over the Cumberland River. The Tennessee Central Railroad has agreed to contribute $10,000 to the work.

CHARLES CITY, IOWA.—The Commercial Club has agitated the question of building a concrete bridge over Cedar River, to cost $60,000.

CHARLOTTE, N. C.—Bids are wanted, Feb. 29, by D. P. Hutchison, Chairman, for building a steel bridge with 100-ft. span, over Ervins Creek.

CHATHAM, ONT.—The Canadian Pacific will probably build a bridge over Jeannette's Creek, near the Raleigh and Tilbury town line.

CHATTANOOGA, TENN.—The viaduct to be built over the railroad tracks is to be of steel, about 1,100 ft. long. Bids will soon be asked by W. L. Dodds, County Engineer.

CHICAGO, ILL.—The Drainage Board has approved plans and bids are being asked, April 3, for a new bascule bridge, to be built over the Chicago River at Harrison street.

CLAY CENTER, NEB.—Bids are wanted, Feb. 23, by W. M. Campbell, County Clerk, for building all the bridges needed in Clay County up to Dec. 31, 1904.

CLEVELAND, OHIO.—Bids are wanted, March 2, by the Board of Commissioners of Cuyahoga County, for the steel superstructure of a bridge between Brecksville and Royalton.

COHOES, N. Y.—Plans have been made for building a double track bridge over the Mohawk River at Ontario street, to cost about $22,000. Charles H. Van Auken is city engineer.

COLUMBUS, OHIO.—The county has authorized the building of bridges over Alum and Big Walnut Creeks, on the Taylor road, at a total cost of $22,000.

EAST LIVERPOOL, OHIO.—The North American Manufacturing Company will build a steel bridge, 1,700 ft. long, over the Ohio River, to cost about $200,000. W. E. Wells can give information.

ELLWOOD CITY, PA.—The viewers appointed to select a site for a bridge over the Beaver River for the joint account of Beaver and Lawrence counties have recommended the building of the bridge.

ERIE, PA.—The Road Commissioners of Greenfield, Harbor Creek and Greene townships have under consideration a bridge 350 ft. long and 100 ft. high over Four-Mile Creek at Cane Hill.

GLENWOOD SPRINGS, COLO.—A steel bridge 306 ft. long, to cost about $10,000, is to be built over the Grand River at Balzac. The date for receiving bids has not been fixed. William Cardnell is county clerk.

GRUNDY, VA.—Bids will be asked in July for building a steel bridge 120 ft. long over the State Creek and Dismal Swamp. George W. Childress is chairman of the board.

HALIFAX, N. S.—The Nova Scotia Government estimates the cost of necessary rebuilding bridges in the province for large bridges at $478,000 and $438,000 for smaller bridges. A large portion of the work will be done this year. M. Murphy, Halifax, is Provincial Engineer.

INDIANAPOLIS, IND.—The County Commissioners have asked the City Council to issue bonds for about $400,000 for the purpose of building four new bridges over White River.

LITCHFIELD, MINN.—Bids are wanted, March 9, for building a steel bridge, about 100 ft. long, over the Crow River in Meeker County. J. N. Gayner is County Auditor.

LOS ANGELES, CAL.—Contracts for bridge work have recently been awarded by the city as follows: A steel and wooden bridge at Fourth street over Los Angeles River and the tracks of the Southern California Railway and the San Pedro, Los Angeles & Salt Lake R. R., to J. D. Mercereau, of Los Angeles, for $40,493; a steel and wooden bridge over the Los Angeles River at Macy street, to H. S. Farnsworth, of Los Angeles, for $12,484, and a steel and wooden bridge over Arroyo Seco at Pasadena avenue, to the Clinton Bridge & Iron Works, of Clinton, Ia., for $8,833.

The city of Los Angeles and the Pacific Electric Railway Company will jointly build a plate girder bridge over Los Angeles River, at Aliso street. Plans will be ready in about two months. Harry F. Stafford, City Engineer.

MADISON, MONT.—Bids are wanted, March 11, by the Board of County Commissioners, for building a bridge over the Big Hole River near the town of Twin Bridges. It is to be a steel truss of two spans, each 100 ft. long, on cylinder piers. J. C. Clem is County Clerk.

MAYO, FLA.—Bids may soon be asked by J. M. Peacock, Chairman of the Board of County Commissioners, for building a steel bridge 300 ft. long over Eight Mile Creek in Lafayette County.

MIFFLINTOWN, PA.—A bridge will be built by the counties of Snyder and Juniata, over Mahantango Creek, in Susquehanna Township.

MONTEREY, MEX.—The Mexican Central is replacing many of its wooden bridges with steel structures along the line of its road between Monterey and Tampico.

MOSS POINT, MISS.—A petition has been signed by the business men of this section asking permission to build a bridge over Escatampa River at Elder Ferry.

NEWARK, N. J.—The War Department has been asked to approve plans for building a drawbridge over the Passaic River from Avondale to Union Township, in Bergen County.

NEW HAVEN, CONN.—A new drawbridge will have to be built at Double Beach, as the Secretary of War has ordered the present structure removed within six months.

ORILLA, ONT.—The Grand Trunk is preparing to build a new bridge over the Narrows of Lake Couchiching.

OTTUMWA, IOWA.—The City Engineer estimates the cost of improving the bridge at South Ottumwa at $45,000, which includes the adding of two spans and extending the approaches.

OUACHITA CITY, LA.—The United States Senate has passed the bill authorizing the Little Rock & Monroe Railway Company to build a bridge over Ouachita River at a point between Ouachita City and Bayou Loutre.

PAWTUCKET, R. I.—The Common Council has taken action to promote the passage by the State Legislature of an act empowering the city to issue $60,000 in bonds for bridge work.

PERKIOMEN JUNCTION, PA.—A double track iron girder railroad bridge about 1,300 ft. long, to carry the Perkiomen Railroad tracks, it is reported, will be built over the Schuylkill River, to replace the present structure.

PITTSBURG, PA.—The two ends of the cantilever bridge being built by the Wabash Railroad over the Monongahela River were connected Feb. 6.

ST. CATHARINES, ONT.—Several bridges will be built on the line of the new extension of the Hamilton, Grimsby & Beamsville Railway.

ST. BONIFACE, MAN.—Application is being made to the Provincial Government to have the bridge over the Seine River at St. Boniface rebuilt.

ST. LOUIS, MO.—The council has passed a bill for building a bridge over the World's Fair Railroad tracks at Union avenue to cost about $16,000.

Bids may soon be asked for widening the Wabash bridge at Forest Park.

SANATOGA, PA.—The Commissioners of Montgomery and Chester counties are trying to arrange for the building of a bridge connecting the two counties, to cost about $50,000.

SAN LUIS OBISPO, CAL.—The county will build a steel bridge of two spans, 190 ft. and 320 ft. long, over the Selinas River, near Margarita, to cost about $20,000.

SANTA FE, N. MEX.—The Board of County Commissioners has decided to build two additional stone bridges; one over the Santa Fe River and one over Galesteo River.

SIOUX CITY, IOWA.—Bids are again asked, Feb. 23, for building the Floyd River bridge. J. M. Lewis is City Engineer.

SMITHLAND, KY.—Bids will be asked about the first of April for building a steel bridge about 150 ft. long over Bale Creek in Livingston county. G. W. Landram, Clerk.

STEVENS POINT, WIS.—The Wisconsin Central, it is reported, is making plans for the building of three new steel bridges over the main drainage ditches at Buena Vista.

TIFFIN, OHIO.—An iron truss bridge 220 ft. long may soon be built over the Sandusky River by Seneca county.

WARREN, PA.—The Warren Street Railway Company has agreed to pay one-third the cost of building the proposed bridge over Conewango Creek, at Pennsylvania avenue; also one-third the cost of subsequent maintenance.

WILLIAMSPORT, PA.—On the petition of residents of Franklin Township, viewers have been appointed to select a site for a new bridge.

YORK, PA.—Ice in the Susquehanna River carried away the steel bridge belonging to the county which connected Hartman's Island with the mainland, built at a cost of $14,000. A covered bridge in the same section has also been carried away.

Other Structures.

ALLEGHENY, PA.—The Damascus Bronze Company has bought land 50 x 180 ft. adjoining its works as a site for additions to its foundry.

BAYONNE, N. J.—The Public Service Corporation is considering plans for a brick power house on Forty-third street, near the Speedway.

BUTTE, MONT.—The Great Northern, it is reported, has chosen the site for a new passenger station, to cost about $250,000, which will be used by the other roads under a lease or union depot agreement.

CAPE MAY, N. J.—The Pennsylvania is preparing plans for building a new brick passenger station, to cost about $50,000.

CHARLESTON, S. C.—The Southern and the Atlantic Coast Line are making plans for jointly building a passenger station.

CHARLOTTE, N. C.—The Southern Railway, according to reports, is making plans for building a new passenger station.

CHATTANOOGA, TENN.—The Cincinnati, New Orleans & Texas Pacific, it is reported, will double the present capacity of its shops in Chattanooga. Work will soon be commenced, and will cost about $200,000.

CHICAGO, ILL.—The Delaware, Lackawanna & Western Railroad Co. is to build a new coal dock with 300 ft. front, including brick power house, with rapid unloading machinery at Division street, to cost about $50,000.

CINCINNATI, OHIO.—Plans have been made for the Weir Frog Company, in East Norwood, to build machine shops 125 ft. x 660 ft., of iron and steel.

HAWKINSVILLE, GA.—The Hawkinsville & Florida Southern, it is reported, is preparing plans for new shops.

KNOXVILLE, TENN.—The Scott Car Manufacturing Company has bought from various interests the site of the plant of the Southern Car Works, at a cost of about $20,000. The land is about 200 x 300 ft., with a frontage

of over 1,000 ft. on the Southern tracks, and will be used to enlarge the company's works.

La Junta, Colo.—The Atchison, Topeka & Santa Fe shops, local reports state, will be rebuilt at a cost of about $250,000, and will be double the size of the former shops.

Maysville, Ky.—The Maysville Foundry & Machine Company will build a brick addition to its works 60 ft. x 75 ft., and will put in a lot of new machinery, including a large traveling train.

Muncie, Ind.—The Cleveland, Cincinnati, Chicago & St. Louis and the Lake Erie & Western are making plans to jointly build a large freight house.

Newark, N. J.—The Lidgerwood Manufacturing Company, of New York City, has rejected bids for its new buildings in Newark, and will soon ask new ones for a foundry 120 ft. x 600 ft. and a power station 40 ft. x 225 ft. A new machine shop will be added later.

New Haven, Conn.—The New York, New Haven & Hartford, it is reported, has bought land near Union avenue for increasing its yard room at that place.

New Orleans, La.—The St. Louis & San Francisco, it is reported, has secured 15,000 ft. of water front on which it will build large grain elevators.

Pottstown, Pa.—The Glasgow Iron Company will rebuild its plate mill, recently destroyed by fire, replacing the old structure with a steel building 108 ft. x 167 ft., and 80 ft. high, for which bids will soon be asked. C. B. Shoemaker is President.

St. Louis, Mo.—Plans have been completed for building the temporary passenger station for joint use of the railroads entering the fair grounds, at a cost of about $60,000, to be used during the exposition.

Tyler, Texas.—It is announced that the St. Louis Southwestern, of Texas, which has its general offices here, will make extensive improvements to its various terminals in this state during the present year. Plans are now being prepared.

Winnipeg, Man.—The Canadian Northern proposes to begin building its new station at Winnipeg this spring.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Atlantic Coast Line.—Track laying is practically completed on the extension from Punta Gorda, Fla., southeast to Fort Myers, 28 miles, and it is stated that the road will be open for traffic before the end of the month. G. S. Baxter & Co., Jacksonville, Fla., is the contractor. The steel bridge 135 ft. long over the Caloosahatchie River has been completed by the American Bridge Company. (Dec. 4, p. 878.)

Baltimore & Ohio.—Press reports state that, as soon as the weather permits, work will be begun on a cut-off from Mannington, W. Va., southwest to Smithfield, 30 miles. This line will be used for fast freight and will relieve the congestion of the coal traffic in the vicinity of the Fairmont coal fields.

Berlin, Waterloo, Wellesley & Lake Huron.—Application will be made at the next session of the Dominion Parliament by this company for power to extend its line from Waterloo, Ont., in a southwesterly and westerly direction to Bayfield, on Lake Huron, via Stratford and Clinton, 65 miles. The proposed line will parallel the Grand Trunk between these points.

Buffalo, Rochester & Pittsburg.—An officer writes that work is now in progress on extensions from Indiana Junction, Pa., to Black Lick, 45 miles, and from Elders Ridge to Iselin, 19 miles. Track has been laid on the former extension for a distance of 33 miles, and on the latter for a distance of 12 miles. Work is also in progress on eight miles of second track between Stanley and Big Run. This is to be completed by June 1. J. M. Floesch, Rochester, N. Y., is the Engineer in charge of the work. (Dec. 4, p. 878.)

Chesapeake & Ohio.—It is reported that this company is making surveys for an extension from Rosney, Va., southeast to Hawk, eight miles, connecting at the latter point with the Farmville & Powhattan. F. I. Cabell is Engineer in Charge of the Surveys.

Chicago, Anamosa & Northwestern.—Rights of way are being secured and surveys are in progress for this proposed railroad from Anamosa, Iowa, north to Waterloo, 70 miles. It is stated that grading will be begun early in the spring. The road is to be built by the Midland Construction Company. (Jan. 24, p. 72.)

Chicago River & Indiana.—Articles of incorporation have been filed by this company in Illinois. It is proposed to build a railroad from Chicago to a point on the boundary line between Illinois and Indiana. H. T. Gilbert, M. C. Lange, J. H. Sullivan, and others, of Chicago, are incorporators.

Chicago, Rock Island & Pacific.—It is reported that this company will build its own line between Houston, Texas, and Galveston, 51 miles, instead of using the Southern Pacific tracks between these points, as originally intended. It is estimated that the two-mile causeway which the Rock Island and Southern Pacific will build jointly across Galveston Bay will cost about $1,000,000.

Cincinnati, Toledo & Detroit Short Line.—This company has been incorporated to build and operate an electric railroad from Cincinnati to Toledo, passing through Hamilton, Butler, Preble, Darke, Mercer, Van Wert, Paulding, Defiance, Williams, Henry, Fulton and Lucas counties.

Colorado, Oklahoma & Texas.—It is stated that contracts for building this line will be let within 30 days. The proposed route is from Pueblo, Colo., through the Chickasaw Reservation and through Comanche, Kiowa Washita and other counties in Oklahoma, to Denison, Texas, approximately 450 miles. E. E. Colby, Pueblo, Colo., is Chief Engineer. (Sept. 11, p. 660.)

Columbia Southern.—An officer writes that contracts will be let about March 4 for building this line from Shaniko, Oregon, to Bend, 100 miles. Surveys have been completed and rights of way secured. B. E. Lytle is President, and A. E. Hammond, Portland, Ore., is Chief Engineer.

Columbus, Greensburg & Richmond (Electric).—An officer denies the report that this company has let a contract for building its new line from Columbus through Greensburg and Connersville to Richmond, Ind., 96 miles. Rights of way have been secured and surveys are now in progress. Contracts for grading will be let about May 1. The character of the work is light, with a maximum grade of one and one-half per cent., and maximum curvature of three degrees. C. N. Wilson, Indianapolis, is General Manager. (Feb. 12, p. 120.)

Diamond & Calder.—This company has been incorporated in California to build a railroad from Diamond Springs, in Eldorado County, Cal., to Dogtown, 35 miles. The road is owned by the California Sash & Door Company. (Jan. 15, p. 53.)

Dublin & Southwestern.—A charter has been asked for this company in Georgia with power to build a railroad from Dublin southwest via Eastman to Abbeville, 45 miles. Grading will be begun at once. E. P. Dentz, Dublin, Ga., and W. D. Harper and J. J. Simpson, Atlanta, Ga., are incorporators.

Escanaba & Lake Superior.—Surveys are reported in progress for an extension of this line from Gleason, Mich., northeast to Austin, 12 miles. W. E. Wells, Wells, Mich., is General Superintendent. (June 19, p. 449.)

Georgia, Florida & Alabama.—It is reported that this company will soon begin work on an extension from Cuthbert, Ga., northwest to Columbus, 50 miles. The road runs at present from Tallahassee, Fla., to Cuthbert, 107 miles. Surveys for this extension have been completed. J. P. Williams, Savannah, is Superintendent. (Jan. 15, p. 54.)

Georgia Traction.—Rights of way have been secured for this new electric line in Georgia, and grading has been begun. The proposed route is from Carnesville southwest through Madison and Clarke counties to Athens, 40 miles. B. F. Aderhold and John Dortch, Carnesville, Ga., are incorporators. (Jan. 1, p. 18.)

Gulf & Interstate.—It is reported that this company will build a branch from Winnie, Texas, north to Lufkin, 115 miles. The road runs at present between Port Bolivar and Beaumont, 73 miles. L. L. Featherstone, Beaumont, Texas, is General Superintendent.

Halifax & Southwestern.—An officer writes that work is now in progress on two lines, one from Halifax, N. S., to Mahone, 68 miles, and the other from Bridgewater to Barrington, 117 miles. Grading has been completed on the former line for a distance of 55 miles, and on the latter for a distance of 25 miles. This company owns the railroad which was formerly the Central of Nova Scotia, running between Mahone and Bridgewater. T. H. White is Chief Engineer.

Jacksonville & Concord (C., B. & Q.).—This company, which was recently incorporated in Illinois by the Chicago, Burlington & Quincy interests, has completed its road from Jacksonville northwest to Concord, 10 miles. The new line connects two branches of the C., B. & Q. (Oct. 30, p. 786.)

Knoxville, Lafollette & Jellico.—This company has filed an amendment to its charter providing for the building of a branch line from a point near the Empire Marble Works, in Knox County, Tenn., to the plant of the Knoxville Iron Company, Knoxville.

Louisville & Nashville.—Press reports state that this company will soon begin surveys for a branch line from Jasper, Ga., southeast through Jefferson to connect with the Georgia Railroad at Athens, 65 miles. R. Montfort, Louisville, Ky., is Chief Engineer.

Memphis & Gulf.—Final surveys are now being made for this proposed road from Grenada, Miss., southeast through Meridian to Pensacola, Fla., approximately 300 miles. The maximum grade will be .8 and the maximum curvature 6 deg. There will be two steel bridges crossing the Tombigbee and Alabama rivers respectively. C. H. Pond is President and H. P. Farrar, Randolph building, Memphis, Tenn., is the Engineer in charge of the work. (Nov. 27, p. 858.)

Mexican Roads.—A concession has been granted by the Mexican Government to Luis Torres, of Chihuahua, Mexico, for building a railroad from Naco, on the border of Arizona, to Montezuma, 100 miles.

Midland Valley.—This company, which recently purchased the Muskogee Southern, running from Muskogee, Ind. T., to the Canadian River, 30 miles, has let contracts for grading the 30-mile gap between the two roads, from Bokoshe, Ind. T., to the Canadian River. The construction of this line will be completed about May 1, making a total mileage of 125 miles from Muskogee, Ind. T., to Hartford, Ark. F. A. Molitor, Fort Smith, Ark., is Chief Engineer, and C. E. Ingersoll, Philadelphia, is President. (Jan. 24, p. 72.)

Minnesota & International.—Work on this proposed line from Bemidji, Minn., via Turtle and Northone to Koochiching, 110 miles, has been completed as far as Northone. It is stated that the entire line will be completed by Sept. 1. Grading is now being done by the company's forces, as the work of the contractors has not proved satisfactory.

New York, Ontario & Western.—Surveys are in progress for an extension of the Monticello branch of this road, from Monticello, N. Y., northwest through Jeffersonville, to Callicoon, 20 miles.

New York Short Line (Philadelphia & Reading).—Press reports state that rights of way have been secured and surveys completed for the proposed cut-off of the Reading between Cheltenham, Pa., and Neshaminy Falls, eight miles. Contracts for grading will probably be let early in the spring. The new line will shorten the distance between Philadelphia and New York, and will avoid several heavy grades. It will be a double track, and will be used principally for freight. (May 15, p. 352.)

Pennsylvania.—Work has been begun on a cut-off from a point between Mann's Choice, Pa., and Bedford, by way of Altoona and Hollidaysburg.

Pontiac & Interprovincial.—Application will be made at the next session of the Dominion Parliament for the incorporation of a company to build from Waltham, Que., the present terminus of the Pontiac Pacific branch of the Ottawa, Northern & Western (Canadian Pacific), in an easterly direction across the Ottawa River to a junction with the Canadian Pacific near Chalk River, Ont., 25 miles. Gorman & O'Connor, Ottawa, are acting for the promotors.

Raleigh & Pamlico Sound.—An officer writes that this company has no intention of letting any more contracts. Grading is now in progress and the work is being done by the company with convict labor. The road is projected from Raleigh, N. C., east through Wilson and Greenville to Washington, 95 miles. E. M. Turner, Raleigh, N. C., is President, and T. M. T. McKernan is Chief Engineer. (Feb 12, p. 120.)

Southern.—An officer writes that the following work is now being done by this company: Spur line, from Knoxville and Augusta branch, along the bluffs of the Tennessee River, in an easterly direction through Knox County, about four-fifths of a mile. This work is to be completed by May 1. An extension of the Big Mountain Spur, about 1½ miles west of Oliver Springs, Tenn., in a westerly direction through Morgan County for a distance of three miles, to be completed March 1; Badham Spur, leaving the main line near Daley, Ala., running along Savage Creek for a distance of four miles, to be completed about May 1; Carolina & Tennessee Southern branch, surveys now in progress; change of grades and alinement between Manassas and Orange, Va., W. J. Oliver, contractor, to be completed about June 1, and a branch line from Okolona, Miss., to Houston, 29 miles, contractor, H. C. McCarary & Company, to be completed by July 1.

Southern Pacific.—The newspapers say that this company will build an extension from Midfields, Texas, to Refugio, 110 miles.

An officer denies that this company has secured a concession from the Mexican Government for building and operating a railroad throughout the Peninsula of Lower California.

Thorold & Lake Erie.—Application will be made at the next session of Parliament for the incorporation of this company to build a railroad from Thorold, Ont., southeast to Fort Erie, 20 miles, with a branch from Port Colborne, northwest to Brantford, Ont. German & Pettit, of Welland, Ont., are acting for the promotors.

Topeka, Eskridge & Council Grove.—Two routes have been surveyed for this proposed road in Kansas. One is from Topeka via Auburn to Eskridge, 35 miles, and the other is by the river route and is 28 miles long. It is not stated which of these two routes the company will adopt.

Topeka, Frankfort & Northwestern.—Surveys have been completed and rights of way secured for this proposed railroad from Topeka, Kan., northwest to Waterville, 70 miles. It is stated that the contracts for grading will be let in the spring. P. L. Wise, Topeka, Kan., is Chief Engineer. (Jan. 15, p. 54.)

Vancouver, Victoria & Eastern.—Rights of way have been secured for the extension of this road from Grand Forks, B. C., to the Granby mines, at Phoenix, 23 miles. It is stated that grading will be begun within 90 days. J. H. Kennedy, Grand Forks, B. C., is Chief Engineer. (April 10, p. 274.)

Wabash.—An officer writes that work has been begun on a second track from Litchfield, Ill., to Worden, 20 miles, and from Poag, Ill., to Brooklyn, 14 miles. The contract for the first section has been let to MacArthur Bros., Chicago, and for the second section to the Ware Construction Company, St. Louis. There are no important bridges and the contract calls for the completion of the work by June 1, 1904. (Feb. 5, p. 104.)

Watertown & Webster.—Articles of incorporation have been filed by this company in South Dakota. It is proposed to build from Watertown northwest to Webster, 50 miles. Connection will be made with the Chicago & Northwestern at Watertown, and with the Chicago, Milwaukee & St. Paul at Webster. A. C. Burnsted, J. N. Long, J. W. Bond, J. L. Edsall, and others, of Watertown, S. Dak., are incorporators.

GENERAL RAILROAD NEWS.

Ballston Terminal.—F. H. Beach and W. S. Waterburg have been appointed receivers of this company, which owns a road 13 miles long. The road will be sold at auction in Saratoga, N. Y., on March 8. (Jan. 29, p. 88.)

Erie.—A call of 25 per cent. has been made by J. P. Morgan & Co. upon the syndicate underwriting the first $10,000,000 issue of the $50,000,000 4 per cent. convertible bonds authorized on Feb. 11, 1903. It was agreed that the underwriting syndicate would take such bonds as were not subscribed for by the trust certificate holders. The bonds were offered to the stockholders at 87½, but only $800,000 were taken on the offer. Up to the present time the Erie has drawn $1,000,000 of the $9,000,000 proceeds of the issue, making $8,000,000 the amount still due. The bonds are convertible, from April 1, 1905, to April 1, 1915, into Erie common stock on a basis of $100 in bonds for $200 in stock. When the bonds were issued the directors of the Erie Railroad said: "The Executive Committee has for some time been carefully investigating the needs of the company for additions and improvements, and the proceeds of these $10,000,000 bonds will be applied to meet the requirements for improvements, the most important of which are the construction of modern ferry-houses at Chambers and Twenty-third streets, purchase of new ferryboats, building of modern depot and ferry-houses at Jersey City, rearrangement of tracks and terminals at that point, and the construction of a new line through an open cut over Bergen Hill, to avoid the use of the present tunnel for passenger trains."

New York, New Haven & Hartford.—This company has officially announced that it has purchased a majority of the stock of the Central New England, which runs from Hartford, Conn., through Springfield, Mass., to Campbell Hall, N. Y., 200 miles. (Feb. 12, p. 120.)

Pennsylvania.—The $50,000,000 notes of this company, which were recently taken by Kuhn, Loeb & Company, have all been sold to financial institutions in New York City, Boston and Philadelphia. (Feb. 12, p. 120.)

Tehuantepec National.—Press reports state that the Mexican Government has cancelled the lease of this railroad, which is held by Sir Weetman Pearson, an English contractor. The lease was made two years ago, and was for a period of 52 years. This action is in accord with the plan of the Mexican Government to consolidate the Interoceanic and the National of Mexico with the Tehuantepec National.

Seaboard Air Line.—At a recent meeting of the directors of this company, a bond issue was authorized not exceeding $5,000,000, the proceeds to be used for general purposes. For description of these bonds, see our issue of Jan. 15, 1904.

Wabash.—A special meeting of the bondholders and stockholders of this company will be held at Toledo, on March 22, for the purpose of authorizing an increase of $50,000,000 in the company's capital stock. There are outstanding at the present time about $95,000,000 bonds, $24,000,000 preferred and $28,000,000 common stock. An increase of $50,000,000 in the common shares would bring the capital stock to $102,000,000. President Joseph Ramsey has officially stated that the new stock will not be issued at present, but will only be authorized.

Worcester & Southbridge Street.—All claims against this Massachusetts company are now being settled on a basis of fifty cents on a dollar. The company went into receivers' hands last spring.